Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

AMERICAN DYESTUFF REPORTER

Knitting Arts Exhibition Number

APRIL 21, 1947
VOLUME 36, No. 8

APR 28

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

DU PONT
Anthraquinone Blue 2GA
For greenish-blue shades with good fastness to light, alkali, perspiration, and salt water... excellent for women's wear, carpet stock, and bathing suit yarns. Because of its level-dyeing properties, Du Pont Anthraquinone Blue 2GA is also recommended for shading tans, browns, and greens. It has good solubility... is suitable for application to yarns and piece goods by the usual methods. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.
DU PONT
Du Pont Dyestuffs
BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

CHEMICAL RESEARCH *for Fabric Perfection*

*Reg. U. S. Pat. Off.

FORMASET*

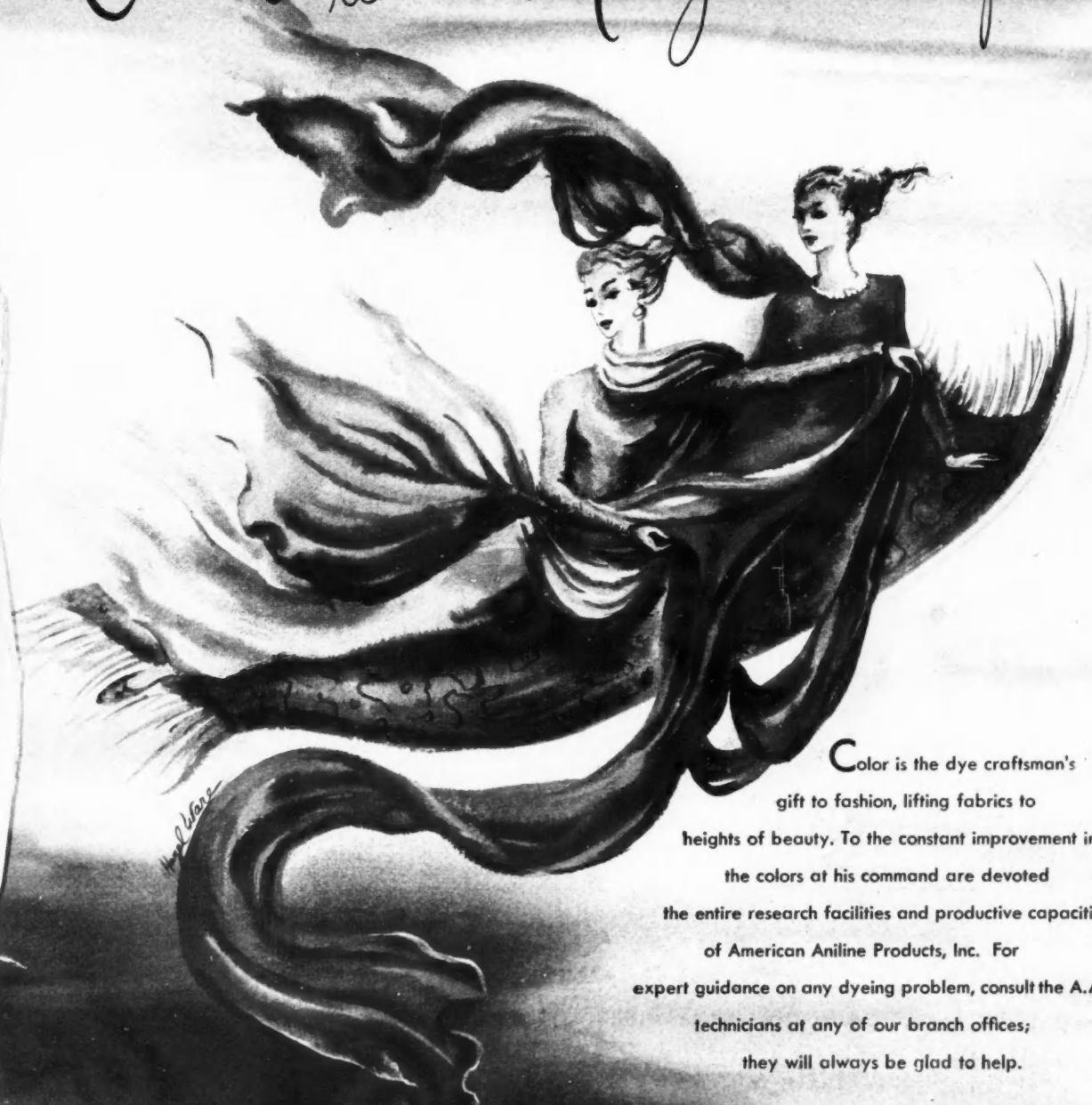
Formaset, synthetic resin finish for textiles, is again available without restriction. Several new types developed as a result of Warwick's war-time research have been added. Each Formaset has its particular advantages designed to solve specific finishing problems. Warwick technical advisors will gladly work with you in determining the correct Formaset for your needs.

WARWICK CHEMICAL COMPANY

A Division of Sun Chemical Corporation

580 FIFTH AVENUE, NEW YORK 19, N. Y.

Color is a Magic Carpet



Color is the dye craftsman's gift to fashion, lifting fabrics to heights of beauty. To the constant improvement in the colors at his command are devoted the entire research facilities and productive capacities of American Aniline Products, Inc. For expert guidance on any dyeing problem, consult the A.A.P. technicians at any of our branch offices; they will always be glad to help.

AMERICAN ANILINE PRODUCTS, INC.

50 UNION SQUARE, NEW YORK, N. Y.
Plant: Lock Haven, Pa.
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Philadelphia, Pa. · Charlotte, N. C. · Chicago, Ill.
Los Angeles, Cal. · Chattanooga, Tenn.
Dominion Anilines & Chemicals Ltd.
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IF YOU WANT

DURABLE *Softness*

Paramine TA is the modern cationic finish for acetate, viscose, cotton and mixed fibres. Mills using Paramine TA for dress goods, glove fabrics, tricot and other types of knitted materials have found this finish offers added sales appeal.

Thorough penetration of Paramine TA assures a softness within the yarn itself that gives materials a full hand and desirable drape — its substantive action produces a durable, lasting finish — Application is simple.

Use Paramine TA

*Reg. U. S. Pat. Off.

WRITE FOR DETAILS OR DEMONSTRATION

Arkansas Co. INC.

Manufacturers of Industrial Chemicals for Over 40 Years

NEWARK, NEW JERSEY

American Dyestuff Reporter, Vol. 36, No. 8, April 21, 1947. Published every other Monday. Copyright, 1947, by Howes Publishing Co., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00; Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

GENERAL DYESTUFF CORPORATION

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DYESTUFFS FOR NYLON

We are offering a selected group of special dyestuffs for Nylon. This group covers a wide range of shades with good light and wash fastness. Our sales representative will be glad to furnish you with complete information

GENERAL DYESTUFF CORPORATION

An old friend

of the rayon industry returns

NOPCO* 1111

premier soaking oil and warp size softener

Back "in harness" for the first time since the beginning of the war, Nopco 1111 returns to assure rayon throwsters and weavers the same quality and uniformity which made it the standard in pre-war days.

*REG. U. S. PAT. OFF.

WRITE for data bulletins "Important Points Regarding Rayon Warp Sizing," "Nopco 1111 – Soaking Oil for Rayon Crepe Yarns."

NOPCO CHEMICAL COMPANY, HARRISON, N. J.

(Formerly National Oil Products Company)

Branches: Boston • Chicago • Cedartown, Ga. • Richmond, Calif.

NOPCO

REG. U.S. PAT. OFF.

EVOLVED THROUGH RESEARCH

Spunjel
FOR WARP SIZING SPUN RAYON

Photo courtesy of:
A. D. JULLIARD & CO., INC.

for solid blending

SPUNJEL maintains the original fiber blend balance in the yarn. Its high adhesiveness and strong, flexible film securely anchors all surface fibers—and effectively reduces shedding on the slashers and looms. It assures a woven fabric that closely approximates the pleasing appearance and hand of expensive worsteds.

SPUNJEL is a specially prepared warp sizing for spun rayon blends containing cotton, wool, acetate and other natural and synthetic fibers. Its high adhesiveness produces results similar to gelatin and makes it particularly suitable for single or plied yarns of acetate or protein fibers.

SPUNJEL—which is readily desized by all standard procedures—permits the woven fabric to fluff out better because it has been woven tightly without loss of bulk through shedding.

National also produces: **NALEX** for cotton and worsted warp sizing; **AMBERTEX** a heavy-bodied thickener for white discharge, direct and vat color printing; **FIBERTEX** for textile finishing; **FLOTEX** to replace natural gums for printing; **FLOJEL** uniform, thin boiling corn starches in all standard fluidities; **HOOSIER** Pearl Cornstarch.

Offices: 270 Madison Avenue, New York 16; Boston, Philadelphia, Atlanta, New Orleans, Indianapolis, Chicago, San Francisco and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto and Montreal. In Holland: Nationale Zetmeelindustrie, N. V., Veendam.

National
STARCH PRODUCTS

STARCHES—AND SPECIALTIES WITH EASILY DEMONSTRATED SUPERIORITY

Conceded!

It is conceded you are using

the fastest-to-light Direct Dyes

when you employ . . . . . .

Solophenyl* Colors

For only the fastest-to-light are permitted to bear the name Solophenyl.

*Reg. U. S. Patent Office

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Dyestuff Makers Since 1859

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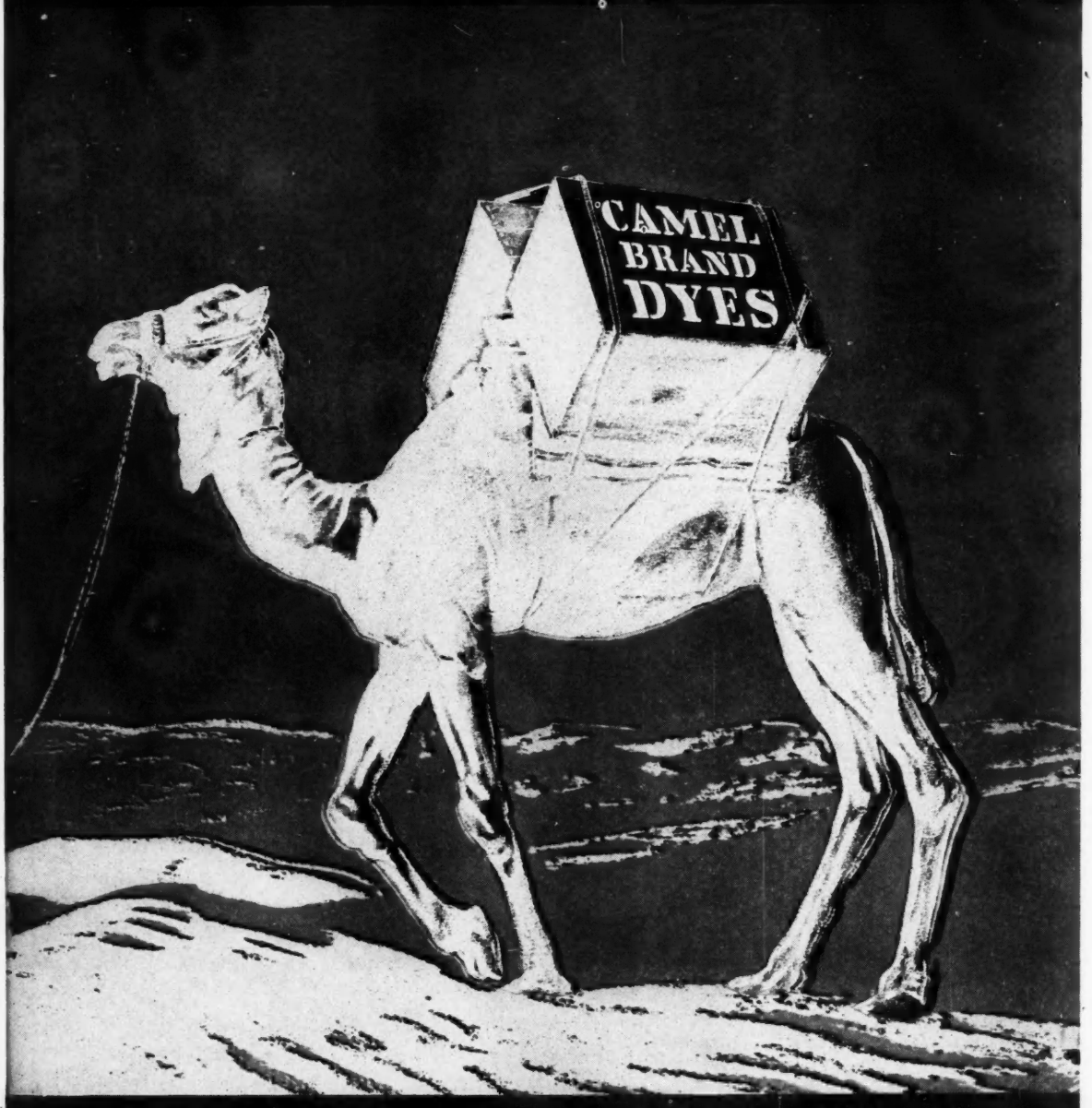
QUALITY DYESTUFFS

SINCE 1878



JOHN CAMPBELL & COMPANY, INC.

75 HUDSON STREET • NEW YORK CITY

TELEPHONE: BArclay 7-6228-6229

PHILADELPHIA: BROAD AND SPRING GARDEN STS.

BRANCH OFFICES AND WAREHOUSES:

BOSTON EAST CLEVELAND, OHIO ATLANTA, GA.

ETERNALURE D-15 RESIN FINISH FOR NYLONS

Photograph courtesy Proctor & Schwarts, Inc.

No Sticking to Forms!!

No Build-Up of Deposits!!

When you use this water-dispersed finish on your Nylon hose, you'll have no trouble with hose sticking, or with building up of deposits on the forms.

There are many other reasons why you should investigate this dependable one-treatment finish.

BOOTH 218

OTHER ADVANTAGES

- Imparts notable snag resistance.
- Gives a good body without undesirable stiffness.
- Clarifies and tightens stitch without sacrificing length.
- Gives adequate dulling without danger of chalky deposits due to uneven deposition.
- Especially useful for giving a body to sheer hose for easier handling after boarding.
- Treated hose can be handled with a minimum of pull threads.
- The finish lasts for the life of the hose.
- The finish is insoluble when dry, unlike conventional finishes.
- Easy to use without changes in operations or equipment.
- One single treatment is all that is required. No assistants are needed.
- Dermatologically safe, having no primary irritating effect and causing no sensitization.

onyx

RESIN FINISHES FOR HOSIERY

Onyx Oil & Chemical Company

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In Canada: Onyx Oil & Chemical Co., Ltd. Montreal, Toronto, St. Johns, Que.

For Export: Onyx International Jersey City 2, N. J.

Combining HIGH PRODUCTIVE CAPACITY and QUALITY DRYING—

PROCTOR *Loop* DRYER

One of the most versatile drying machines ever developed for the textile mill is the modern Proctor Loop Dryer. This rugged, high capacity machine combines large scale output with dependably high quality finished results. While it has long been used for the drying of toweling and washed dyehouse goods, it has recently proven itself in the drying of spun rayons and similarly finished fabrics. Many recent installations have been designed for high temperatures and are being used with marked success for curing resin treated fabrics. There are many operating advantages that make this machine worth the textile finisher's close investigation. Not the least of these is the air looping device by which cloth is formed into loops over the conveyor girts. The photograph at the right was taken *in action*—and is unretouched. It shows clearly the uniformity of loops and the careful manner in which these loops are formed. Accurate control of temperatures and air circulation, to suit character of goods being dried, makes possible using the machine for a variety of weights and finishes. Covered conveyor girts that revolve intermittently prevent finished goods from being marred by stick marks.

If the drying of toweling, washed dyehouse goods, finished piece goods—or the curing of resin treated fabrics—is part of your plant operation, you would do well to investigate the details of the modern Proctor Loop Dryer.

PHILADELPHIA 20, PA.

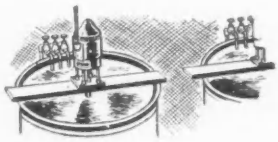
PROCTOR & SCHWARTZ INC.

3 amines FOR emulsions AND detergents

MONO ISOPROPANOL AMINE

DI ISOPROPANOL AMINE

TRI ISOPROPANOLAMINE



Emulsions are easily prepared with isopropanolamine soaps because they permit wide flexibility in formulation. A liquid mixture of the three isopropanolamines is available and is especially suitable for this purpose. The low alkalinity of such emulsions is advantageous too, for it prevents corrosion of metals or injury to fine textiles.

Soaps formed with the isopropanolamines and fatty acids are light in color and do not darken under normal storage conditions. The high oil solubility of isopropanolamine soaps is also particularly valuable when they are used to formulate "soluble" oils with refined mineral oil. This is desirable in rayon coning oils, where good color stability and low free fatty acid content are important.

Monoisopropanolamine and diisopropanolamine are useful as intermediates in the manufacture of synthetic detergents by condensation with fatty acids or acid chlorides. These detergents are advantageous because of low alkalinity and resistance to hard water.

Samples will be supplied upon request for your evaluation as emulsifying agents and intermediates for detergents. For technical data sheets on properties and specifications write or phone our nearest office.

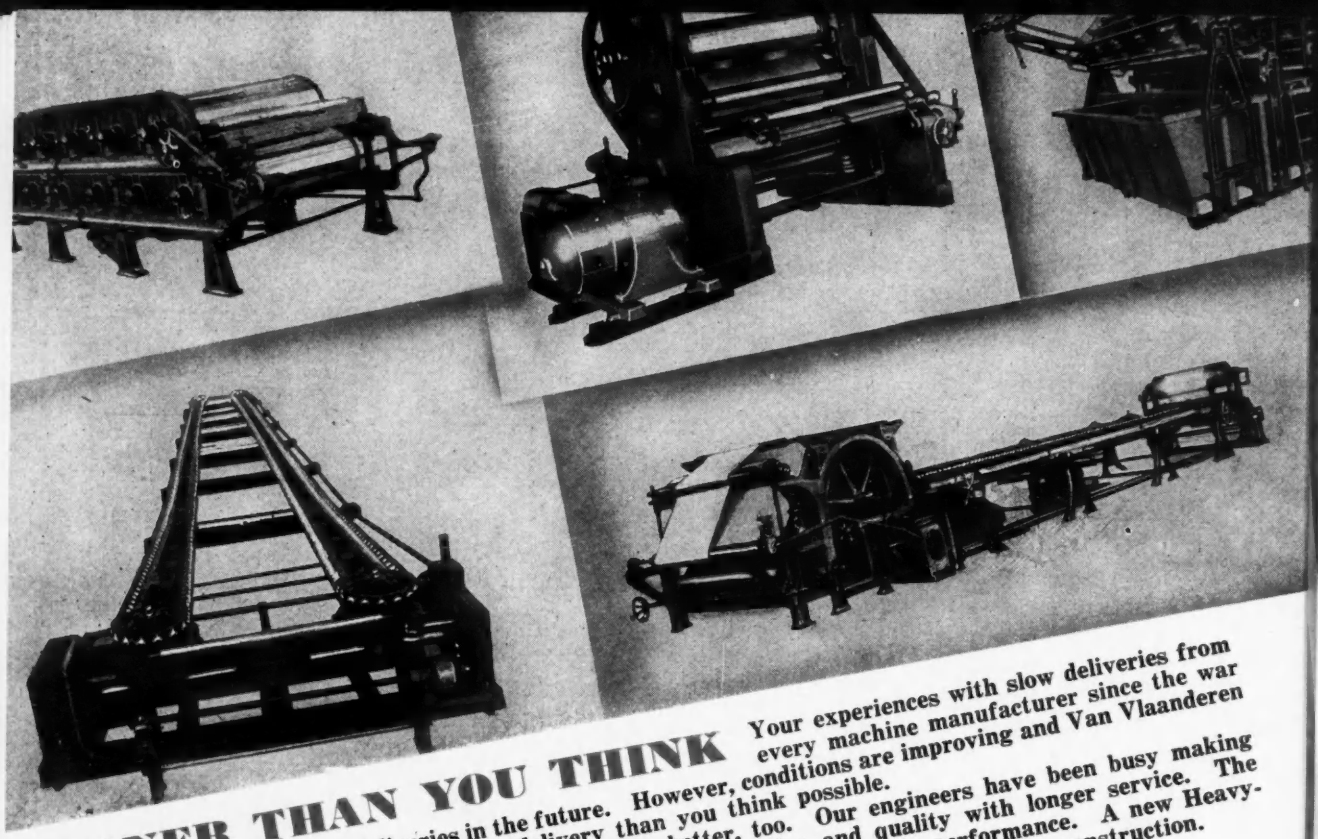
CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N. Y.

Offices in Principal Cities



SOONER THAN YOU THINK

Your experiences with slow deliveries from every machine manufacturer since the war may cause you to expect slow deliveries in the future. However, conditions are improving and Van Vlaanderen may be able to take your order for earlier delivery than you think possible.

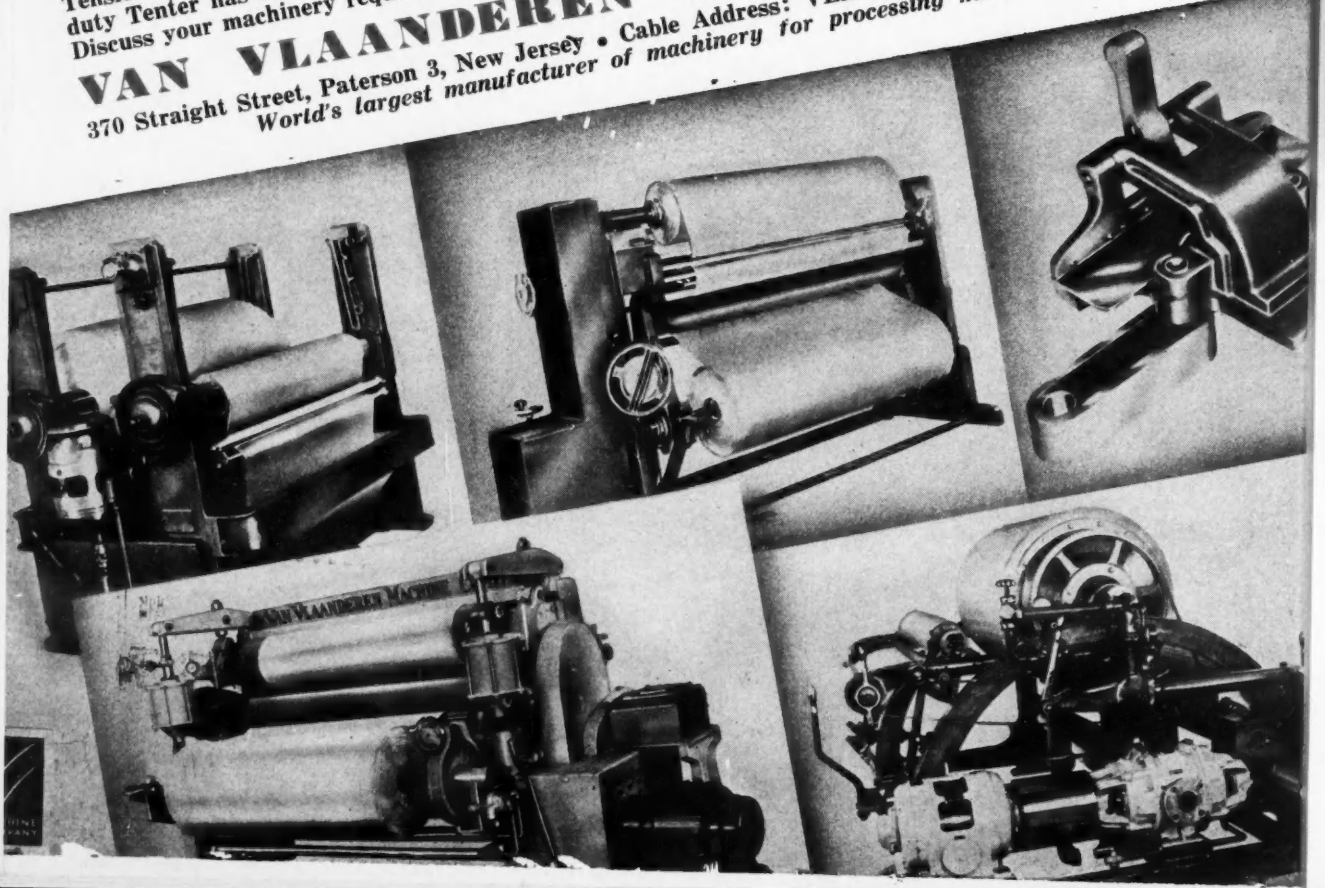
The Van Vlaanderen Equipment you buy now will be better, too. Our engineers have been busy making improvements on many of our machines to give better production and quality with longer service. The Tensionless Jig, the Tuber, the Tenter Clip and others have been improved in performance. A new Heavy-duty Tenter has been added for those who want the last word in capacity and modern construction.

Discuss your machinery requirements with us.

VAN VLAANDEREN MACHINE COMPANY

370 Straight Street, Paterson 3, New Jersey • Cable Address: VLAANDEREN, PATERSONNJ, U. S. A.

World's largest manufacturer of machinery for processing modern fabrics



With Color added—a wisp of net and a bolt of taffeta become Dame Fashion's latest creation; a drum of drab lacquer transmutes into eye-compelling nail enamel; a calfskin kip and a swatch of suede become Cinderella slippers... precious far beyond the value of such prosaic raw materials. Such is the magic of Color in giving these materials dramatic, high-style value in consumer markets. Indeed the sales appeal of Color in modern merchandising is still in its infancy.

To capitalize the selling power of Color in the competitive days ahead, always specify National Aniline Dyes.

WHEREVER COLOR IS USED

National Aniline

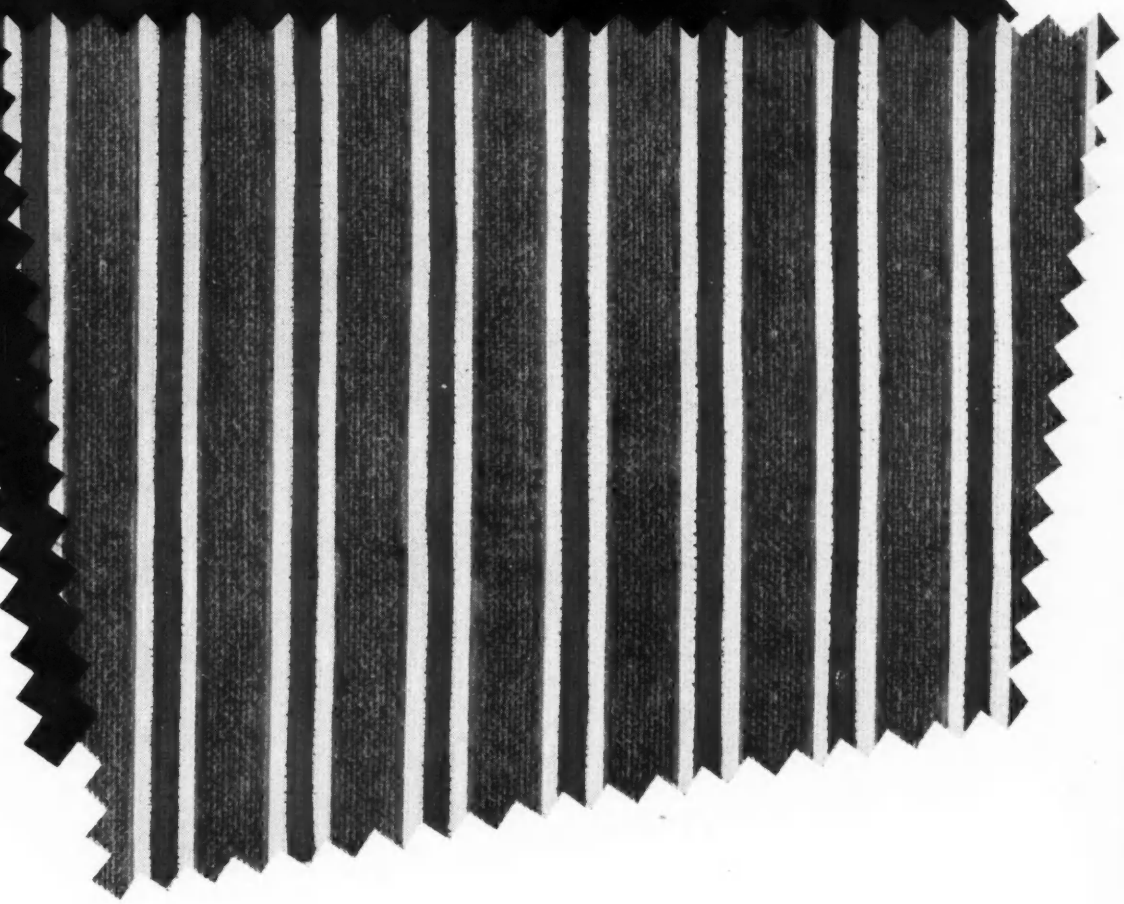
DIVISION OF

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET NEW YORK 6, N. Y.

BOSTON • PROVIDENCE • PHILADELPHIA • GREENSBORO • CHARLOTTE • ATLANTA • NEW ORLEANS • CHATTANOOGA • SAN FRANCISCO • PORTLAND, ORE. • CHICAGO • TORONTO

HOW WOULD YOU PRINT THIS PATTERN ON *Aralac + Cotton* FABRIC?



Acme Finishing Company was asked by Stehli and Co., Inc., prominent New York Converter, to print this pattern on a fabric consisting of 55% Aralac and 45% cotton. For this unusual job, Acme executives chose the following unusual, but fool-proof method.

The gray stripe was printed with the new low-crock Aridye* Black FK 4214 cut 1:80 with Aridye Clear 6214. The red was printed with an Aquadye* emulsion made with Rapidogen Red G dissolved by the Rapidogen Developer Method and added to the aqueous phase of the emulsion. After printing, the fabric was dried, acid aged, washed, and finished.

Result—a well-covered, smooth print, with a uniform shade on both the Aralac and cotton.

Important—the Aralac and cotton fabric suffered no damage as might have occurred with strongly alkaline vat pastes.

More and more, Acme and other leading companies are turning to the use of Aridye pigment colors for solving unusual problems and for improving their everyday printing jobs. Interchemical technical representatives are available to help *you* solve *your* problems and produce better printing.

Write to Interchemical Corporation—Textile Colors Division, P. O. Box 357, Fair Lawn, N. J.

*Reg. U. S. Pat. Off.

CHECK THESE EIGHT ADVANTAGES

Sharpness of Mark • Exceptional Fastness to Sunlight
Uniformity of Shade • Fastness to Washing
Bright Colors • Economy
Ease of Application • No Impairment of Hand

Aridye *Pigment colors*

INTERCHEMICAL CORPORATION • TEXTILE COLORS DIVISION, FAIR LAWN, N. J. • ROCK HILL, S. C. • PROVIDENCE, R. I.

Vanesta

A *NEW* Starch Stabilizer

R·T·VANDERBILT·CO·N·Y·
VANESTA
AMERICAN PRODUCTS

Stops Gelling

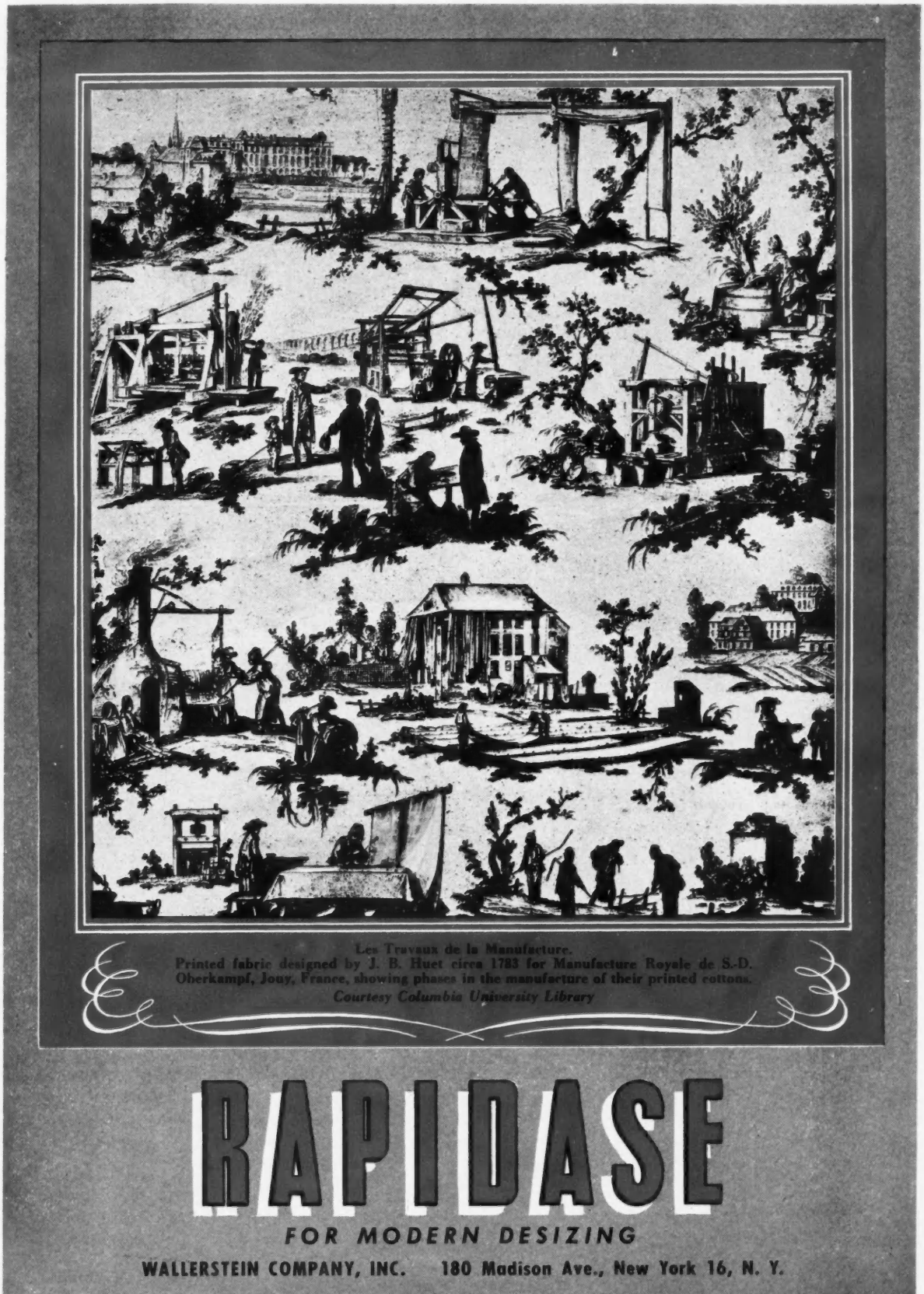
Improves Flow

Gives Uniform Consistency

Sample on request

R. T. VANDERBILT CO., INC.

230 Park Avenue, New York 17, N. Y.



Les Travaux de la Manufacture.
Printed fabric designed by J. B. Huet circa 1783 for Manufacture Royale de S.-D. Oberkampf, Jouy, France, showing phases in the manufacture of their printed cottons.
Courtesy Columbia University Library

RAPIDASE

FOR MODERN DESIZING

WALLERSTEIN COMPANY, INC. 180 Madison Ave., New York 16, N. Y.

NYANZA

ANILINE & ALIZARINE COLORS

•

TEXTILE CHEMICALS

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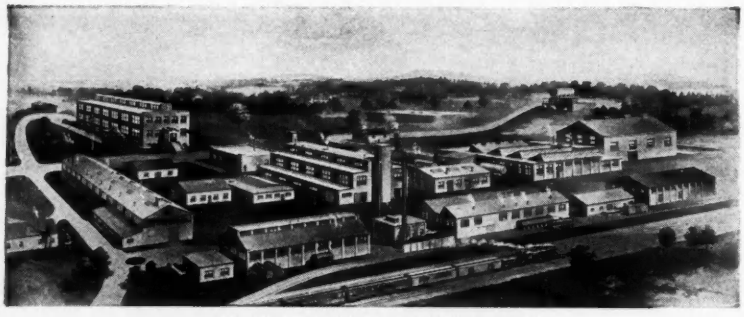
FINISHING MATERIALS

FOR

WOOL — COTTON — RAYON — ACETATE

AND MIXED FIBERS



FACTORY AT ASHLAND, MASSACHUSETTS

NYANZA COLOR & CHEMICAL COMPANY, Inc.

215 WATER STREET NEW YORK CITY

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CANADIAN AGENTS:

Charles Albert Smith Limited, 123 Liberty St., Toronto, Canada

Look what's happened to our wool shirts—

they're washable

THE MEN'S FLOOR

LORD & TAYLOR

These sports shirts won't require dry-cleaning. They're made of Lanaset* treated all wool—wool that takes to soap and water like cottons do, with as little chance of shrinking*.

Express to the Tenth Floor

*Will not shrink over 5%

A reproduction of half page advertisement in New York Times.

WASHABILITY will sell your woolens, too... Use *Lanaset** Resin

By planning *now* to put washability into your fall line of woolens, you are assured of increased sales, spontaneous customer approval. For, one sure way to make woolens salable is to make them washable . . . and LANASET* Resin does just that. It controls wool shrinkage and preserves the original fabric texture even after repeated hand launderings.

Our Technical Staff will gladly assist you in obtaining best results with LANASET Resin.

AMERICAN CYANAMID COMPANY
TEXTILE RESIN DEPARTMENT
BOUND BROOK, NEW JERSEY
New York • Chicago • Boston
Philadelphia • Charlotte • Providence

*Reg. U. S. Pat. Off.

See THE FIRST POST-WAR

OF NEW SMITH-DRUM

For Hosiery Dyeing . . .

See the 1947 model of the famous SMITH-DRUM Hosiery Dyeing Machine . . . the outstanding leader in sales for the past 30 years . . . the machine which dyes 9 out of every 10 pairs of hosiery made in the United States and Canada. If you are interested producing uniformly perfect work and holding o erating and maintenance costs to a minimum, do miss this exhibit.

For Package Dyeing... Extracting... Drying..

See the first and only complete *system* specifically designed to handle yarn in package form . . . sample dyeing, package forming, dyeing, extracting and drying Each machine is the result of extensive research and experimentation to develop the best design for the specific purpose of handling packag only. This system results in faster, more unifo work . . . cuts costs . . . reduces labor. All machin will be on exhibit at the Show.

For Skein Dyeing . . .

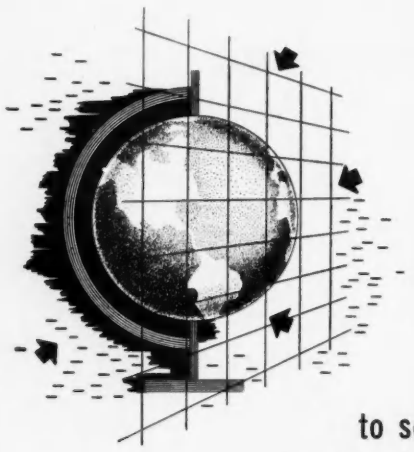
See the machine that has completely revolutionized skein dyeing . . . that has increased production as much as 50% . . . reduced dyeing costs 25% to 30% . . . improved quality 20% to 100% . . . cut winding costs 25% to 50%! The improved po war model of this noted Smith-Drum machine w be on exhibit.

Be sure to attend this most important exhibit in more than a decade . . . the Knitting Arts Exhibition at Atlantic City. You are cordially invited to make the Smith-Drum Booth your headquarters. We'll be looking for you!

SMITH, DRUM & COMPANY
Allegheny Avenue at 5th Street, Philadelphia 33, Pennsylvania

AT THE KNITTING ARTS

EXHIBIT
MACHINES
EXHIBITION . . Booths 24-33



Spin the Globe...

There's a FALLEK Representative Everywhere!

Here is your opportunity to secure World Wide Distribution for American Dyestuffs ...

READ THESE FIGURES!

92% of the world's total exports in Coal-Tar Colors, Dyes and Stains were supplied by Europe to the rest of the world.*

4.6% of the world's total exports in Coal-Tar Colors, Dyes, and Stains were supplied by the United States to the rest of the world.*

With foreign production at a minimum level, now is the opportune time for American Suppliers to secure a solid foothold in the most lucrative overseas markets . . . and here is how FALLEK can help you:

FALLEK . . . eliminates costly credit risks. *You receive your check when your goods are ready for shipment* . . . as simple as a domestic transaction, but larger profits.

FALLEK . . . creates an acceptance for your products throughout world markets that assures continuous business.

FALLEK . . . gains you the proper entree with leading firms of known responsibility.

FALLEK . . . gives you intelligent, daily sales coverage through representatives located in every world market.

FALLEK . . . means permanence, through long established outlets in Europe, Latin America, and the Orient.

FALLEK . . . saves you the detail handling and numerous expenses of operating an export department.

FALLEK . . . brings you men of wide experience, men highly skilled in the problems of world distribution . . . plus skilled technicians in every foreign office fully equipped to render all the technical information necessary to users of American Dyestuffs.

American dyestuffs for textiles, leather, paper, etc., are in urgent demand throughout the world. You can realize a sizeable share of this business by making FALLEK your foreign selling agents. THIS is the time to safeguard profits against the hazards of "buyer's market" or a falling off in domestic demand, by developing a substantial export volume. FALLEK can do this for you.

**U. S. Tariff Commission Report No. 19 last pre-war figures*

WRITE, WIRE OR PHONE FOR FURTHER INFORMATION.

FALLEK PRODUCTS COMPANY, INC.

149 BROADWAY • NEW YORK 6, N. Y.

SPECIALISTS IN ORGANIC CHEMICALS

MORE AND MORE DYESTUFF MANUFACTURERS ARE USING

MARASPERSE*

a group of exceptional dispersing agents

Whether you're producing acetate, pigment, or vat-colors, it will pay you to investigate MARASPERSE. Derived from the lignin component of wood, these dispersants are highly purified, non-hygroscopic, non-foaming, free-flowing powders and free of reducing sugars.

MARASPERSE C
is calcium lignosulfonate with a pH of 7 (3% solution)

MARASPERSE N
is sodium lignosulfonate with a pH of 7 (3% solution)

MARASPERSE CB
is a partially desulfonated sodium lignosulfonate with a pH of 9 (3% solution)

We fully appreciate the specific nature of each problem involving dispersants and consequent difficulty in making general recommendations. In this connection our technical service is available for consultation and cooperative effort in the solution of your problem.

Samples and supplementary literature will be supplied on request.

MARATHON CORPORATION
Chemical Division
ROTHSCHILD • WISCONSIN

Reg.

The FINISH is the Payoff!

In the race for sales, too, the finish is everything. Hosiery . . . and other textile products . . . must have that thoroughbred appearance to be "in the money."

For specialized chemicals—water repellents, mildew-proofings, etc.—as well as standard oils or finishing materials, you'll find that FANCOURT quality and personalized attention to your problems will help you take—and keep—the lead.

Try Resin B and Nyatex for beautifully finished nylons. Reduce handling damage; add sales appeal

W. F. FANCOURT & CO.

PHILADELPHIA, PA.

In the South, Howard A. Virkler, Greensboro, N.C.

Solving Finishing Problems Since 1904

A Topper in Copper...

CALCOSOL*

COPPER BROWN PASTE

HERE'S a *new color*—CALCOSOL* Copper Brown Paste—*not* a mixture.

CALCOSOL Copper Brown Paste produces shades with very good fastness to light, washing and bleaching. It is important not only as a self-color, as a base for light to medium browns and dusty rose shades, but also as a red-brown shading component for other shades. Very desirable and extremely fast shades of gray are produced with combinations of CALCOSOL Gray 2G Double Paste and CALCOSOL Copper Brown Paste.

CALCOSOL Copper Brown Paste is recommended for most types of application on raw stock, yarn or piece goods. It dyes well on wool tops and slubbing, producing dyeings of very good light fastness and is suitable for a shading element for automotive shades.

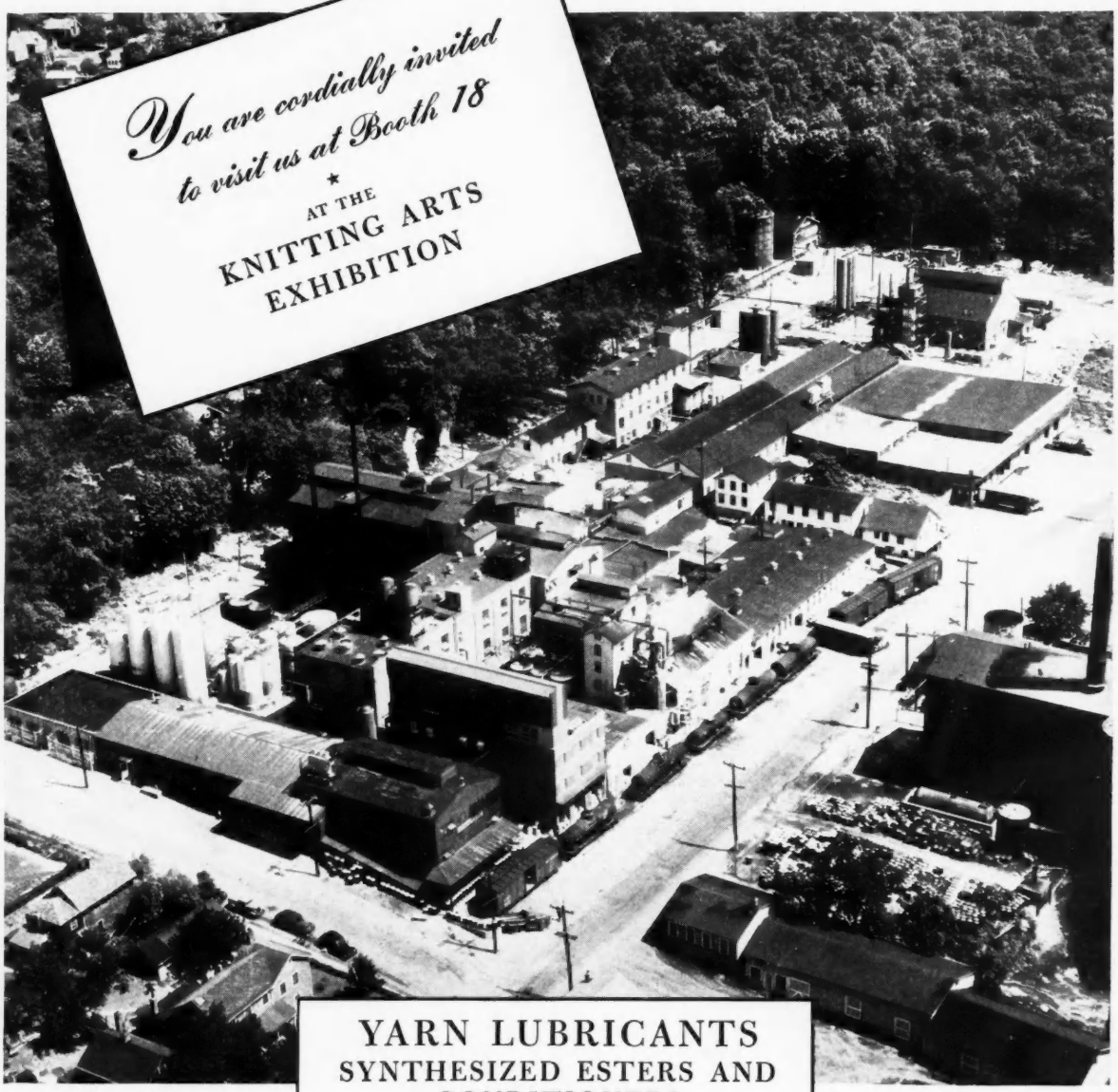
Ask your Calco representative for full details on this or any of Calco's full line of vat dyes.

CALCO CHEMICAL DIVISION, AMERICAN CYANAMID COMPANY, Bound Brook, New Jersey, New York, Chicago, Philadelphia, Boston, Charlotte, Providence.

*Trade-mark

Calco

Reprints of this advertisement suitable for framing and without text will be sent on request.



YARN LUBRICANTS
SYNTHESIZED ESTERS AND CONDITIONERS
for Throwsters, Knitters, Weavers

E. F. DREW & CO., INC.

15 EAST 26th STREET • NEW YORK 10, N. Y.

• FACTORY & LABORATORIES: BOONTON, N. J. •

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NEOLENES

(NONYLNAPHTHALENES)

INTERMEDIATES FOR ANIONIC SURFACE ACTIVE COMPOUNDS

SULFONATION OF NEOLENES
produces superior
WETTING AGENTS and DETERGENTS

Further information and samples gladly supplied at your request.

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for

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DIETHYLAMINE DIBUTYLAMINE

TRIETHYLAMINE TRIBUTYLAMINE

DIETHYLETHANOLAMINES

DIETHYLAMINOETHANOL

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Canada: SHAWINIGAN CHEMICALS LTD., Montreal, Quebec

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Stockings finished with Filaseal have *memory*—that extra quality that maintains the fresh, smooth appearance that sells hosiery. *Memory* causes stockings to return to their original shape. No matter how they are handled or creased, they always look new and appealing.

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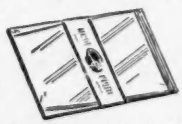

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Laurel Wool Oils for maximum lubrication.

Laurel Wool Scouring Compounds for speedier detergent action, cleaner, more even dyeings, cleaner, softer, loftier wool.

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Testing Company representatives will be on hand to demonstrate and explain the various hosiery tests and the use and application of certified Throwster Tints.

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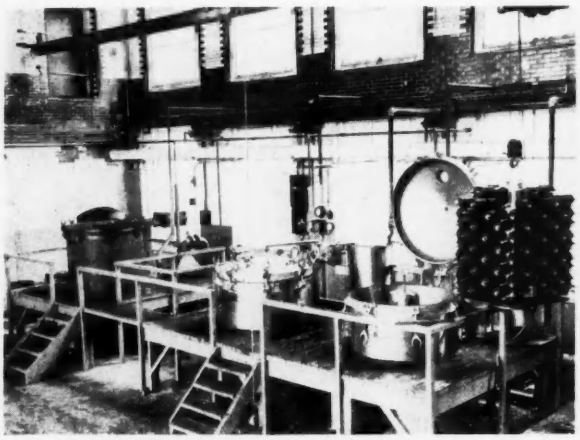
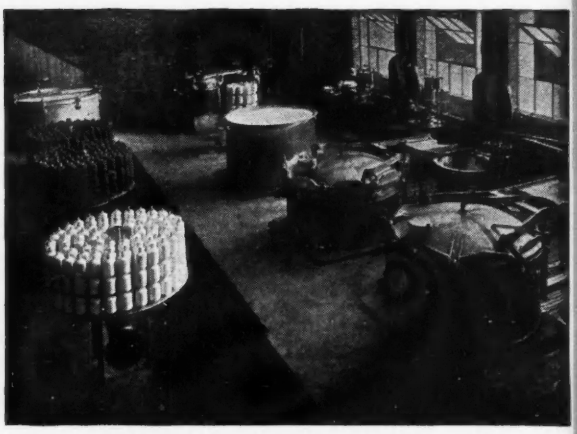
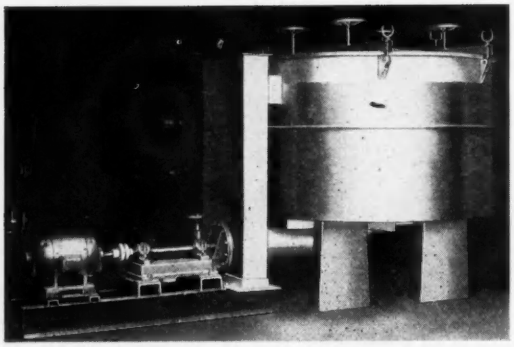


Model KRAG package dyeing installation with pressure extracting on the same material carrier.

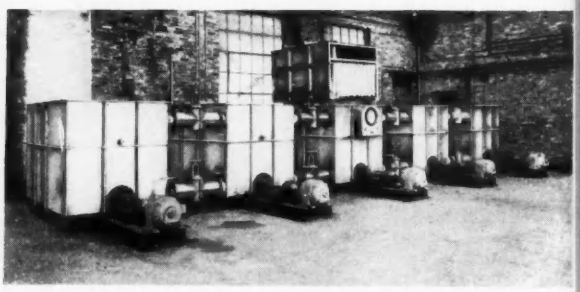


Model UKSAG package dyeing installation with closed pressure extractor and open dryers in a complete cycle on the same material carrier.



Model NUAPR Wool Raw Stock Dyeing Machine.

Model RAPR Worsted Top Dyeing Machine —Spindle System.



New Model GAWET Worsted Skein Dyeing Machine — 200 lbs. to 1,000 lbs. per batch.

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"Lodovico Lazzati Ltd."
Caixa Postal 994
Sao Paulo, Brazil, S. A.

COLOMBIA
Fernando
Cabo Olozaga
Apartado Aereo 37-68
Bogota Colombia, S. A.

INDIA
Associated
Textile Engineers
43 Forbes Street
Fort, Bombay, India

Knitting Arts Exhibition Number

AMERICAN

DYESTUFF REPORTER

VOLUME 36 | APRIL 21, 1947 | NUMBER 8

Thirty-Eighth

Knitting Arts Exhibition

Atlantic City Auditorium, Atlantic City, N. J.
April 29th through May 2nd, 1947

AFTER a lapse during the war years, the Knitting Arts Exhibition resumes this year at the Atlantic City Auditorium, Alantic City, N. J. This exhibition for the entire knit goods trade is held under the auspices of the National Association of Hosiery Manufacturers. It will open on April 29th and run through May 2nd. All available exhibition space has been sold.

It is anticipated that, in the future, the exhibit will be held every odd year instead of annually, as in the past. This is being done at the request of exhibitors who wish a greater lapse of time for development of new equipment and for new advances.

For the convenience of readers of the REPORTER there follows a description of those exhibits in which they will have the greatest interest.

* * *

Air-Perme-Ator Mfg. Co.
Paterson, N. J.
Space 84

A small sized machine will be shown in operation demonstrating the principle of "dry humidification" — humidification by filmation or molecular suspension of water.

In attendance: John Kohut, Edward Kohut and Richard G. Burr.

Amalgamated Chemical Corp.
Rorer and Ontario Streets
Philadelphia 34, Pa.
Space 352

Textile chemicals.

In attendance—Harold B. Dohner, Robert A. Bruce, Claude H. Crane and John M. Jester.

Bausch & Lomb Optical Co.
Rochester 2, N. Y.
Space 323

The Ortho-Rater, a new optical instrument designed for rapid and reliable measurement of employee visual characteristics will be exhibited.

In attendance—W. A. Carter and C. P. Brownell.

S. Blickman, Inc.
Weehawken, N. J.
Spaces 88 and 89

Equipment will be featured including the following: fully enclosed dyebox; small wares such as pails, dippers, buckets, and wet-goods trucks. These items are representative of the stainless steel dyeing and finishing equipment of this company.

In attendance — Bernard Blickman, George Langhirt and Edgar Olsen.

H. W. Butterworth & Sons Co., Inc.
York and Cedar Streets
Philadelphia 25, Pa.
Spaces 155, 166 and 193

Textile finishing machinery and rayon equipment. Products will not be exhibited but space will be used for reception purposes.

Carolina Aniline & Extract Co.
301 S. Cedar Street
Charlotte, N. C.
Space 59

Products include FF Cleanser, used to clean full fashioned and seamless machines when nylon yarn is used, and Humiclean, used in spray chambers and cooling towers to keep them free from algae and slime.

In attendance—G. S. McCarty, E. H. Steere, Jr., E. B. Simpson and Robert O. Simpson.

E. F. Drew & Co., Inc.
Boonton, N. J.
Space 18

Products shown will include synthesized esters, fiber lubricants, and yarn conditioners for throwsters, knitters and weavers.

In attendance—H. A. Carman, Dr. D. S. Chamberlin, W. A. Cummings, L. W. Davis, K. W. Hartman, Dr. E. I. Valko.

W. F. Fancourt & Co.
516-518 South Delaware Ave.
Philadelphia, Pa.
Spaces 341 and 342

Featured at this exhibit will be a complete new line of finishing materials for the hosiery and piece goods trade with particular stress on a new resin development, which is said to be a permanent one-product finish for use on nylon hosiery. It is said to impart good body, fine hand and feel to the finest denier nylon. It is further said to tighten and clarify the stitches and impart a certain degree of dulling in itself. It is a one-bath operation and is applied in the conventional manner. It is stated that hosiery finished with this treatment is highly snag resistant. Also exhibited will be dyeing and scouring compounds and various denier finished nylon hosiery.

In attendance—Walter F. Fancourt, Jr., Walter F. Fancourt, 3rd, John L. Fancourt,

Howard A. Virkler and Claude G. Wolff.

Grand Rapids Textile Machinery Co., Inc.
1405 S. Division Ave.
Grand Rapids, Mich.
Spaces 145 and 146

Large comprehensive photographs of various types of equipment, such as dyeing, drying, finishing, cutting and pressing machinery for tubular knit underwear and outerwear fabrics and garments, will be exhibited.

In attendance—W. H. Shields, W. F. Moon and M. F. Shields.

H. C. Harding, Inc.
Second and Tilghman Streets
Philadelphia, Pa.
Space 3

This exhibit will consist of textile oils and chemicals, featuring specialty products for the knitting trade.

In attendance—George J. Reihl and Horace C. Harding.

Indianapolis Chemical Co., Inc.
Davidson and Michigan Streets
Indianapolis, Ind.
Space 178

This exhibit will show special products for hosiery including nylon trough solution and nylon cleaning solution.

In attendance—H. T. Smolenski, J. L. Thibodeau and M. E. Edington.

International Nickel Co., Inc.
67 Wall Street
New York 5, N. Y.
Spaces 7 and 8

The use of corrosion resistant materials in dyeing, bleaching, and finishing plants will be featured at this exhibit. Mill and fabricated forms of Monel and Inconel will be shown. Fabricated forms will include hosiery dyeing machines, covered rolls, conditioning cabinets, moistening boxes, size cooking kettles, tank linings, and utensils and other accessories.

In attendance—C. J. Bianowicz in charge.

International Salt Company, Inc.
Scranton, Pa.
Spaces 149 and 150

A completely equipped Lixator (miniature) of stainless steel, one foot in diameter, with accompanying brine storage tank, will be in operation using Sterling Rock Salt. Also exhibited will be a 30" standard Lixator, together with brine meters and other auxiliary equipment for completely servicing the production and distribution of brine throughout textile plants.

In attendance—D. W. Hengerer, assistant sales development engineer, N. M. Agnew, field engineer, and A. J. Hulsebosch, field engineer.

Kali Manufacturing Company
427 Moyer Street
Philadelphia 25, Pa.
Space 51

This exhibit will consist of Kalpinols, used in the troughs for the wetting out of nylon before knitting, Hydroxy Hand Cream, used by the knitters and handlers of nylon, K.N.K. (Kali Needle Kleaner), for cleaning needles on full fashioned machines where nylon is being knit, various types of oils to be used for the oiling of nylon, oils for use in oiling viscose and acetate, and various finishing products.

In attendance—William B. Griffin, Atlanta representative, John Gilroy, representative in part of North Carolina, Virginia and West Virginia, Frederick L. Muller, George M. Mackenzie, James A. Branegan, Jr., Eugene W. Wall, and S. G. Davenport, President of Kali.

Kearny Mfg. Co., Inc.
Kearny, N. J.
Spaces 92, 93 and 151

The main exhibit will be a new device for hygrolitting yarn packages while in the process of being formed. Other products will also be exhibited including a psychrometer for instant determination of moisture in textiles and relative humidity.

In attendance—George Westwater, vice-president and sales manager, H. Sonntag, J. J. Garrigan and John F. Dulkin.

Walter Kidde & Company, Inc.
Belleville, N. J.
Kidde Manufacturing Co., Inc.
Bloomfield, N. J.
Spaces 251 and 252

Exhibited here will be the Kidde Tension and Density Control, the new Kidde Tensometer and the new Kidde Knitter.

In attendance—C. L. Griffin, W. J. Behr, Jr., J. S. Gosnell and R. J. Reiner.

Laurel Soap Mfg. Co., Inc.
Tioga, Thompson & Almond Sts.
Philadelphia 34, Pa.
Spaces 260 and 285

Soaps, oils and finishes for the textile industry.

In attendance—Clarence E. Bertolet, Elmer C. Bertolet, William H. Bertolet, Jr., E. W. Seasongood, and T. C. Holst, from Philadelphia; A. Henry Gaede, Charlotte; A. O. Hayes, New York; W. R. Sargent, Greenville.

Onyx Oil & Chemical Company
Jersey City, N. J.
Space 218

While Onyx products for the improvement of dyeing and finishing operations on all types of knit goods will be presented, the main feature of this exhibit will be Eternalure D-15, a one-treatment resi finish for nylon and rayon hosiery which it is claimed, has been enthusiastically ac cepted by the industry since its introduc tion in 1946.

In attendance—Leon P. Brick, vice president, Albert R. Jenny, sales manager Alexander C. Mackey, director of hosiery division, Emil Peters, assistant director o hosiery division, J. W. Huber, Philadel pha, R. A. Watson, Philadelphia, H. L Haley, Northern New Jersey, W. S Trezise, New York, S. A. Trezise, New York, J. E. Trezise, New England, E. W Klumph, Charlotte, Cliff Myers, Charlotte Thomas Wilheit, Atlanta, C. R. Smith Atlanta, and F. E. Schroeder, Chicago.

Philadelphia Metal Drying Form Co., Inc.
4550 Torresdale Ave.
Philadelphia 24, Pa.
Space 72AA

This exhibit will include the patented Philadelphia Multi-Shape Form and Ad justoe Form for boarding a wide variety of goods from infant's socks to ladies full fashioned hosiery. New steam tables, em bodying several improvements, will also be exhibited.

In attendance — Joseph Seligman and Thomas A. Temple.

E. W. Pike & Co.
492 North Avenue
Elizabeth 3, N. J.
Space 16

Featured at this exhibit will be the "Flash-O-Lens" Illuminated Magnifier, with built-in light, which is said to actually spotlight all types of textile inspection at the same time as it magnifies the work. Direct light rays do not reach the eye of the user. Both a battery model and electric model are available.

In attendance—Mrs. S. N. Pike and Arthur E. Klee.

Proctor & Schwartz, Inc.
Seventh Street and Tabor Road
Philadelphia 20, Pa.
Spaces 157 to 164, inclusive

The Proctor Automatic Boarding Ma chine for women's hosiery and the new Proctor Pre-Boarding Machine for nylon hosiery will be exhibited. The Boarding Machine will be in operation, finishing women's hosiery. The nylon Pre-Boarding Machine will be operated mechanically but will probably not be operated with steam.

In attendance—Charles S. Tiers, William J. Merrigan, Raymond Helder and Justin Pearson.

(Concluded on Page 188)

Hosiery Dyeing and Finishing in the Past Twenty-Five Years

R. H. SMITH
Melrose Hosiery Mills

DURING the last twenty-five years many changes have occurred in the dyeing of hosiery. The basic processes have been about the same, but better colors, chemicals, and equipment have changed the complexion of the whole problem making it a little easier than twenty-five years ago.

Equipment

Twenty-five years ago we found quite a few wooden vats. The goods were agitated by hand, using a good strong back, arm, and pole. Better plants had put in wooden paddles and some metal paddles. Logwood Black was still being used to some extent, and it required the cages in which the goods were oxidized. Rotary dyeing machines made their debut soon, but for many years the paddle was used by many representative mills and still today they are being used by some half hose plants. Each has its advantages and disadvantages, but a good job of dyeing can be done in either.

Color Fastness

Colors of today are faster than the colors of twenty-five years ago, but the hosiery field has farther to go in this respect than any other type of dyeing. The hosiery fastness committee of the AATCC and the dyestuff companies are striving to remedy this situation. A greater buyer and consumer demand for faster colors and a willingness to pay the difference in cost must come before the mills can meet competition and use faster colors.

Half Hose

A plain cotton or mercerized half hose was the bulk of the production twenty-five years ago. Some wool combinations were offered in the better and higher priced brands. Rayon and acetate made their appearance pretty soon, bringing the first fancy effects. Combinations of cotton, wool, rayon, and acetate along with silk, dyed acetate stripes and sewed-in or automatic immunized clocks were used in half hose for many years until the war. Ingrain half hose have been made to some extent over a period of twenty years, growing in demand during the last ten years.

During the war most mills were making a heavy mercerized, 100% wool, or 50% wool and 50% cotton half hose for the government. The wool combinations were preshrunk using the calcium hypochlorite process. Since the war many new preshrinking processes have been brought out offering some advantages over the war time method.

Since the war, hosiery mills have run whatever they could get yarn for, using any combination available. Nylon has made its appearance in half hose solid numbers or in combination with rayon, wool, cotton, or acetate.

Direct colors have been used as the basic colors in most half hose during the last twenty-five years with developed colors and after-treated colors being used on better lines. Developed colors, acetate dyes for acetate yarns, and wool colors have about covered the colors used.

Colors giving better unions between rayons and cotton were offered about 1930. These colors likewise left acetate whiter than heretofore. After a careful selection of colors, better color effects could be obtained than before. Logwood black gave way to sulfur black on solid mercerized and cotton black. Around 1927 to 1930 sulfur blacks were replaced by the direct blacks after-treated with formaldehyde.

Turkey Red Oil, sulfonated castor oil, pine oil, and the present day rapid penetrants have been used as penetrants and wetting out agents along with soap and the present synthetic detergents acting as buffers in the dye bath. Chemicals for diazotizing and developing, plus softeners in some cases. have about completed the chemicals and finishing of half hose.

Anklets

Anklets have been constructed along the lines of half hose using mostly cotton, rayon, and wool with acetate stripes at times. Direct fast to light colors have been employed in about ninety per cent of anklet dyeing along with developed colors for ingrain styles. Chemicals and finishes for anklets have been about the same as half hose. Anklets have been prominent in the hosiery trade for about fifteen years and have grown to great proportions during this time. At the present time several mills are experimenting with vat colors to replace fast to light directs. Increased costs and creating consumer demand are the big problems confronting this experiment.

Ladies Hose

Twenty-five years ago found mercerized and cotton ladies hose predominant with a smattering of full fashioned silk and very little rayon goods. The full fashioned was mostly eleven thread silk with a mercerized foot and twelve inch mercerized welt. Dresses were quite long in those days covering the long welts, and eleven thread silk lasted quite a while compared with the present day two thread silk and fifteen denier nylon.

Mercerized and rayon ladies hose was almost all seamless with the exception of a few mills who made some rayon fashion and mercerized sport goods.

Full fashioned hose has been the outstanding ladies hose, being made of silk and mercerized cotton or all silk until just before the war when nylon made its appearance. Today nylon holds the spotlight with a little silk back on the market.

Union dyeing direct colors were employed to dye full fashioned silk at first, shading the silk over with silk colors. There were many headaches and many grey hairs acquired during this era due to fact that the union direct colors dyed the silk too heavy one day and too light the next. The colors were affected by acid, alkali, and about anything they came in contact with. The silk colors were just as bad, being affected by the least water variation and would wash off almost with a good rinse. It was about 1928 before direct colors, leaving silk appreciably white and silk colors leaving cotton the same, were brought out. These colors were much faster, more level dyeing, and not so affected by varying conditions. This same group of silk colors is being used today with better cotton colors being substituted in some instances as they have been developed.

Nylon made its advent in 1940 and with it came a new yarn and a different problem altogether. To obtain the best results with this yarn, it had to be preboarded with live steam under pressure. In this way the shape of the stocking was set before dyeing and retained it even after dyeing.

Acetate colors have been used almost wholely on nylon hose. Various other types of colors have been tried, giving

much better fastness but never giving the smooth clear appearance that acetate colors impart to nylon.

Silk hose was dyed for many years in the two bath method using soap for degumming and sulfonated castor oil as a buffer in the dye bath. Later when degumming oils came out, some still used the two bath method, others the split bath, and still others the one bath. Today the split bath is mostly used.

Nylon can be dyed by the one or two bath method. Due to equipment shortage and saving of time, many are using the one bath method. Soap or a synthetic soap and an alkali, plus a solvent in some cases, have been used mostly in the dyebath on nylon.

Due to the heavy thread of silk used for many years, not much finish was used, with the exception of a little softener to aid boarding. As the thread of silk was reduced and more sheer stockings were made many different types of finish were used to improve the appearance and wearing qualities. Most people have used and still use some starch or ingrain material for body building, splash proofing compounds to smooth the stitch, along with a small quantity of duller and softener.

A urea type resin finish has been used on nylon as a base to help eliminate snagging, along with some starch or ingrain material to obtain a body. A small quantity of softener is added to insure better boarding. Recently chemical companies are offering a one piece resin type finish which shows promise.

Bleaching

All hosiery has been bleached during the last twenty-five years with either chlorinated lime, hypochlorite, or peroxide. Due to the many fibers present in some half hose, the hypochlorite bleach has been employed since it can be bleached at low temperatures. Silk and wool must be beached with peroxide.

Conclusion

Hosiery dyeing and finishing has improved tremendously in the past twenty-five years, but much research work must be done to bring it up with other fields of dyeing. Faster colors, better nylon finishes that will insure better snag resistance, and uniform body between the welt and leg, and better colors for multi-fiber half hose leaving unstained other fibers, will be welcomed by the trade as a whole.

Exhibitors—

(Concluded from Page 186)

Scholler Brothers, Inc.
Collins and Westmoreland Sts.
Philadelphia 34, Pa.
Spaces 202, 203, 228, 229, 240 and 241

DuraBeau "S.M.," a new synthetic resin type finish for nylons will be featured at this exhibit. Also shown will be samples of soaps, softeners, sulfonated oils, wetting agents, scouring compounds and finishes, as used on textiles, together with samples of fabrics treated with same. Samples of shrink resistant woolens and wool mixtures treated with an improved chlorination process, involving the use of buffering agents, to prevent under and over chlorination, will also be shown.

In attendance—F. C. Scholler, J. F. Noble, Wm. Jackson, Jr., E. S. Atkinson, L. M. Boyd and W. A. Daniel.

Scott Testers, Inc.
Providence, R. I.
Space 322

The new "Thy-mo-trol" development of constant rate of load drive as applied to the conventional pendulum type of textile tester will be exhibited. This new drive, developed in cooperation with the Schenectady Laboratory of General Electric Company, electrically increases or decreases the speed of the driven clamp to eliminate from the upper clamp or loading end of the tester the effect of stretch in the sample. Also exhibited is a newly developed fabric clamp, a newly designed gear box incorporated in the standard IP-2 Inclined-plane serigraph, and the Ball Burst fabric test attachment which is applied to the conventional pendulum type textile tester.

In attendance—Harold W. Horton and David C. Scott, Jr.

Smith, Drum & Company
Allegheny Ave. below 5th St.
Philadelphia 33, Pa.
Spaces 24 through 33 inclusive

Equipment for dyeing of hosiery and yarn will be exhibited and in operation.

In attendance—Harry S. Drum, William C. Dodson, Al March, Joe Ballentine and Perry Parrott.

Synthane Corporation
Oaks, Pa.
Spaces 170 and 171

This exhibit will consist of a graphic illustration of production activities in general whch consists of laminated phenolic materials in the basic form of sheets, rods and tubes. Samples of machining practices and fabricating facilities to machine parts to customer's designs and specifications will be exhibited. Among the items on display will be a Synthane Drier Pole, bearings for use in bleaching machines, furnisher rolls for printing of textiles and pot-eyes.

In attendance—R. R. Titus, president; J. B. Rittenhouse, vice-president; G. A. Ebelhare, plant supt.; Dr. N. A. Skow, director of research; R. L. Foote, sales engineer; Herbert Widdop, asst. sales manager; J. K. Johnson, Phila. district mgr.; C. B. Moss, Southern sales mgr., and E. E. Smith, Phila. representative.

United States Testing Co., Inc.
1415 Park Avenue
Hoboken, N. J.
Spaces 386 and 387

Exhibited here will be Universal Hosiery Fitting Measure Forms, Leg Measuring Device for proportioned hosiery, and a new type of testing machine known as the Run Resistance Meter.

In attendance—S. B. Walker, H. M. Block, A. J. Kellner and S. C. Mayne, Jr.

Venango Engineering Co., Inc.
G and Lycoming Streets
Philadelphia 24, Pa.
Spaces 226, 227, 242 and 243

Textile dyeing equipment will be exhibited.

In attendance—C. Harry McCandless, sales manager, in charge.

Walton Laboratories, Inc.
1186 Grove Street
Irvington, N. J.
Spaces 152 and 153

On display will be Walton Industrial Humidifiers, with one or two in operation, together with the smaller type Commercial model which is said to be used extensively in small rooms or testing laboratories.

In attendance—Jas. A. Babcock, Chas. F. Jones, Jr., Ben Dickinson and Wm. Feldermann.

Warwick Chemical Co. Division
Sun Chemical Corporation
580 Fifth Avenue
New York 19, N. Y.
Space 38

On display will be a line of chemicals which are applicable to the knitting trade and also fabrics which have been processed with some of these chemicals.

In attendance—Mrs. T. Noyes, M. M. McCann, D. E. York and H. G. Kennedy.

Wyandotte Chemicals Corp.
Wyandotte, Mich.
Space 144

Exhibited here will be products such as Wyandotte Textile White Ash, Wyandotte Huron Alkali, Wyandotte Textile Soda and Wyandotte K.B.X.

In attendance—C. B. Robinson, vice-president in charge of sales, J. B. Ford Division; George le Sueur, export manager; Johne Parsley, William Endriss and Harry Moyer, laundry and textile dept.

Synthetic Fibers and their Dyeing

DR. E. KOESTER

I. G. Farbenindustrie, Leverkusen

Prepared at the request of Thomas R. Smith, OQMG Consultant
Translated by Dr. J. H. Trepagnier, OQMG Consultant

THE developments of modern chemistry brought about revolutionary changes in the old handi-craft methods of dyeing. This is apparent when we consider the rapid growth of the synthetic dyestuff industry which since the middle of the last century has replaced nearly all natural dyes. This is also apparent when we consider the astonishing growth of cellulose chemistry, with the development of artificial fiber, especially of the artificial cellulose staple fibers which, in countries deficient in raw materials, are widely used in place of the classical fibers, wool and cotton. The new dyes brought with them complicated dyeing techniques; while the new fibers made possible the production of many types of mixed fabrics which were often not easy to dye and which constantly presented new problems to the dyer. These problems have been for the most part solved by the development of modern textile auxiliaries and textile finishing agents.

Although previously a wide knowledge in application techniques was required of the dyer and finisher, now even more complicated problems have arisen as a result of introduction of new synthetic fibers which are not derived from cellulose, but which are the outgrowth of modern organic chemistry.

My object will be to survey the field of synthetic fiber dyeing. It will also include a short summary of the development of these fibers.

PeCe Fiber

The first entirely synthetic fiber appeared in Germany in 1934. This was the so-called PeCe fiber of the I. G. which was made from chlorinated polyvinyl chloride. The raw material for PeCe fiber is acetylene (obtained from coal and lime) to which HCl is added. The vinyl chloride so obtained is then polymerized and chlorinated, producing a macromolecule which is semi-plastic and which can be spun into PeCe fiber.

In 1938 a similar fiber under the trade name of "Vinyon" appeared in the United States. This fiber consists of a mixture of polyvinyl chloride and about 10 per cent polyvinyl acetate. Recently other polyvinyl fibers have been developed in the United States and England; namely "Velon," "Koroseal," and "Saran." PeCe fiber has very good tensile strength and it does not swell in water, has good wet strength which is as high as its dry strength. It is resistant to acids and alkalis, oxidizing agents, and reducing agents. However, it should be noted that PeCe swells or dissolves in some aromatic solvents, esters, ketones, and chlorinated solvents. PeCe is absolutely resistant to baceria and rot. The low softening point of PeCe is its principal deficiency. The normal PeCe fiber softens at a temperature of about 70°C. and must therefore be handled carefully. The development of a PeCe fiber which does not soften before the boiling point of water is underway.

Because of these properties the PeCe fibers have found uses mainly in industry; e. g. for filter cloth, acid proof clothing, ropes, cordage, fishing equipment, brush bristles, and other purposes.

Polyamide Fiber

In 1938 another synthetic fiber, nylon, was introduced into the United States. This is a so-called polyamide fiber which duPont has been producing in large quantities and which is now also being manufactured in other countries.

After the development of PeCe fiber, the first synthetic fiber in the world, I. G. continued to work on synthetic fibers and developed another type of polyamide fiber which was different from the American type.

Like polyvinyl chloride, the polyamides are also high molecular compounds which are derived from simple monomeric substances. As their names indicate the polyamides contains the chemical grouping CO-NH which is characteristic for all proteins. For preparing polyamides several methods are used:

(1) Poly-condensation

(a) of diamines and dicarboxylic acids, for example:

$$x H_2N \cdot (CH_2)_6 \cdot NH_2 + x\ HOOC \cdot (CH_2)_4 \cdot COOH =$$

Hexamethylendiamine *Adipic Acid*

$$\left[- HN \cdot (CH_2)_6 \cdot NH - OC \cdot (CH_2)_4 \cdot CO - \right]_x + 2 x\ H_2O$$

Polyamide

(b) of aminocarboxylic acids, for example:

$$x H_2N \cdot (CH_2)_5 \cdot COOH + x\ H_2N \cdot (CH_2)_5 \cdot COOH =$$

ε-Aminocaproic Acid *ε-Aminocaproic Acid*

$$\left[- HN \cdot (CH_2)_5 \cdot CO - HN \cdot (CH_2)_5 \cdot CO - \right] + 2 x\ H_2O$$

Polyamide

These reactions were used by Carothers to build his polyamide after initial experiments with polyesters from dicarboxylic acids and glycolls did not lead to satisfactory results.

(2) Polymerization of seven numbered rings containing an amide group, for example from:

$$2 x \ (CH_2)_5 \begin{cases} NH \\ CO \end{cases} \rightarrow \left[- HN \cdot (CH_2)_5 \cdot CO - HN \cdot (CH_2)_5 - CO - \right]_x$$

ε-Caprolactam *Polyamide*

This is the method used by the I. G. and leads to the same polyamides which were prepared by Carothers by condensing amino carboxylic acid containing terminal amino group.

While in America the duPont Company gave to their polyamide fiber the name "nylon," the I. G. designated their polyamide fibers by the name "Perlon." The various polyamide fiber types were designated by letters. For example, the polyamide fiber prepared from hexamethylendiamine and adipic acid is called Perlon T and the polyamide fiber which is prepared from ε-caprolactam is called Perlon L.

Another method which was also used by the I. G. leads to polyurethanes by means of additional polymerization.

(3) Addition polymerization of di-isocynates and glycols, for example:

$$x\ OCN-(CH_2)_6-NCO + x\ HO-(CH_2)_4\ .\ OH \rightarrow$$

Hexamethylendiamine *4 Butandiol*

$$[-O\ .\ (CH_2)_4-O-CO-NH-(CH_2)_6-NH-CO]_x$$

Polyurethane

Because of many similarities in several basic properties, the I. G. also used the name Perlon to designate their polurethane fibers. Perlon U is the name given to this type of fiber.

Along with their own development of polyamides the I. G. also produced polyamides of the doPont type.

In general, polyamides have a characteristic melting point. For this reason, in the production of synthetic fibers, the polyamide is melted under suitable condition and extruded through spinneretts. The polyamide is then quickly cooled forming long filaments. The so-called threads can be drawn and, by this stretching process, obtain their particular physical properties.

With regard to the properties of the so-called polyamide fibers, nylon and perlon, it can be said that the dry strength is extremely good and surpasses that of natural silk. The wet strength is also very good. The following table summarizes the tensile strength properties and elongation of various fibers. However it must be pointed out, these comparisons alone cannot give a true picture of the real value of a fiber.

	Textile Strength		*Elongation*	
Product	*Dry*	*Wet*	*Dry*	*Wet*
Perlon L	45 —50	43 —44	16 —24	18 —25
Nylon	38 —44	32 —39	16 —23	17 —24
PeCe	16 —17	16 —17	18 —22	18 —22
Natural Silk	30 —40	23 —35	19 —21	26 —30
Cotton	12 —17	13 —19	7 — 8	10 —12
Wool	11.6—13.4	8.7—11.3	33.5—39.8	46.9—54.3
Cord Viscose	25 —27	15 —17	11 —13	15 —17
Viscose	13 —16	7 — 8	18 —25	22 —35
Bember Viscose	15 —16	8 —10	12 —15	23 —28
Acetate Silk	9 —11	5 — 7	22 —24	32 —34

Polyamide fibers swell only slightly in water and absorb only about 4-5% moisture. The swelling and water absorption of the polyurethane fibers is even smaller. The polyamide fibers have good stability against alkalies. The stability to dilute acids suffices for the normal requirement of the textile industry. However, their resistance to concentrated acids is smaller, being far below that of PeCe fiber. The polyamides are stable toward organic solvents being attacked only by phenols.

Polyamide fibers also show great stability toward bacteria, rot, moths and termites.

Polyamide fibers are considerably more stable to heat than PeCe. Their melting points lie between 225° and 260° C, although the fibers soften at a somewhat lower temperature. Polyamide fibers can be ironed provided one observes the precautions normally observed for acetate silk.

In contrast to PeCe fiber the polyamide fibers are used not only for technical purposes but also in the textile industry and clothing industry. Before the war nylon was used in America chiefly for the production of ladies' hosiery in competition with Japanese silk. In Germany it may be expected that Perlon silk will also be of interest for knitted goods after the war. Perlon will also of course be used for weaving, particularly where the primary requirement is high tensile strength. In the form of staple, Perlon will not only be used alone but also in combination with wool or cellulose staple for the production of stockings and cloth, since exhaustive experiments have already shown that relatively small amount of Perlon in mixtures greatly increase their usefulness in woven or knitted goods.

Because of its very god mechanical properties, Perlon will also be used in cable wrappings, belt drives, sails, fish nets, filters and shoe laces.

It should be pointed out here that, for the present, polyamide fibers are not available to civilians in Germany, but are used exclusively in the production of those materials which require high physical properties or great durability.

After this survey of the methods of production and of the properties of synthetic fibers, we will now turn to the question of their dyeing and we will next consider the dyeing of PeCe.

Dyeing of PeCe

Because it does not absorb water and because of the very small internal surface, PeCe filament and PeCe staple cannot be dyed by substantive dyes which depend on absorption for attachment to the fiber. The constitution of the fiber does not permit chemical combination with dyestuffs. Therefore, PeCe cannot be dyed with substantive, vat, acid, or sulfur dyestuffs. The fiber can, however, be dyed to a certain extent with certain acetate dyes. Acetate dyes have, as a group, a certain solubility in the fiber. Furthermore, dyestuff absorption can be increased by the addition to the dye bath of certain swelling agents which, on one hand, are soluble in the fiber and on the other hand dissolve the dyestuff and thereby increase the rate of absorption. It is possible, therefore, by the use of the auxiliary Eulysin PC to produce light to medium shades on the fibers. Heavy shades or black unfortunately cannot be produced in this manner. In this connection it is interesting to note that PeCe staple, in general, can be dyed deeper than filament PeCe, the latter being dyed only with difficulty. It should be noted that acetate dyes of the type, "Celliton," and "Celliton Fast" usually have only poor light fastness on PeCe. Therefore, it is necessary to choose carefully from such dyes to obtain at least medium light fastness. For example the following acetate dyes can be used to produce a field grey:

Celliton Fast Yellow..... 3G
Celliton Fast Brown..... 3R
Celliton Fast Blue.....FFG

Furthermore, it must be noted that in the dyeing of PeCe material, the temperature must not exceed 70°C. and the drying of the material must also be carried out below this temperature. If these precautions are not observed the fiber softens and may stick together, and on cooling the cloth becomes brittle.

It is seen therefore that there are certain limitations in the production of heavy shades or shades which show good light fastness. To obtain colors of this type there still exists the possibility of using fast-to-light pigments, fixing these on the fiber with suitable resins. Such dyeing methods could be used for dyeing tarpaulins, tent material, etc.

While we have seen that there are certain limitations in the dyeing of PeCe fiber, we will, however, find that there are many possibilities in the dyeing of Polyamide fibers.

Dyeing of Polyamide Fibers

In order to understand better the dyeing behavior of polyamide fibers, I wish next to discuss the present day views concerning the dyeing and processing of these materials.

Acetate dyes or dyes which are chemically similar to them, that is, those which have a basic or phenolic character and which have no acid groups, are taken up by the polyamide fiber by a process of solution similar to the process known to occur in the dyeing of acetate fiber with dispersed dyestuffs. However, it is also found that acid and substantive dyes dye polyamide fibers. We have seen that because polyamide fibers have polypetide linkages in the molecule, they have many similarities to wool and protein. From their construction, it is, furthermore, seen that the fibers have amino and carboxylic acid end groups. Investigations have

shown that, as a result of these free amino groups and perhaps to a lesser extent, as a result of imino groups of the polypetide linkages, the fiber can combine to a certain extent with acids and, consequently, with acid dyes. There occurs, therefore, just as the case of wool, a chemical combination of acids and substantive dyes with the fiber. It must, however, be pointed out that the ability of polyamide fibers to absorb acids and their ability to absorb acid dyes at a normal dyeing condition is considerably less than that of wool. Furthermore, our investigations and the investigations of Eloed showed that acid and acid dye absorption is strongly dependent on the pH value at which the determination is made. In strong acid bath the absorption of acids greatly increases.

The relations between chemical combination and pure absorptive combination of the dyes require a somewhat more complete elucidation, especially in the case of certain substantive dyes, some sulfur dyes and vat dyes.

About the dyeing of polyurethane fibers, that is, Perlon U, it can be said that these fibers, up to now, have only been dyed by those dyes which dye by a solution process. Therefore only dyes which are suitable for the dyeing of acetate fabrics, for example, "Celliton" and "Celliton Fast" dyes, can be used.

With respect to the dyeing of nylon which before the war was of great practical importance in America, there is already an extensive literature in the American and English journals. cerns for a long time have been carrying out systematic research, particularly on Nevertheless, the German dyestuff conthe dyeing of Perlon L. Fundamentally there is, indeed, no difference in the dyeing characteristics of the various polyamide fibers. The principal differences occur in the degree of affinity of the various dyestuffs. This depends, among other things, on differences in the relative number of free amino groups caused by variations in polymerization. It also depends on other factors occurring in manufacture. Such differences can occur not only in the various types of polyamide fibers, but also as a result of variation in the manufacture of one type of polyamide fiber.

As a result of thermoplasticity and also as a result of the high degree of drawing of the fiber, polyamide fibers are sensitive to heat when wet. This sensitivity causes rolling, curling, shrinking and crimping during wet handling. Once such defects occur, it is difficult if not impossible to correct them.

Pre-treatment

In order to avoid these difficulties it is necessary to subject the material to a steaming process before dyeing. This process is similar to the steaming or crabbing of wool. This pretreatment is known in the hosiery industry in America as "pre-boarding," which we might call "preforming." This "preforming" usually is carried out at temperatures over 100°C. under pressure, normally at about 115 to 120°C. However, in many cases it is sufficient to carry out the "preforming" without pressure at 98 to 100°C. Preforming" must be carried out under tension. Stockings, for example are "preformed" on metal forms while piece goods are handled in full width on machines used for crabbing and steaming of wool. Possibly special machines will later be designed for this purpose as has already been done in the hosiery industry.

Incidentally, it should be pointed out that the presteaming of polyamide fibers greatly increases their affinity for dyes.

Furthermore, preforming of piece goods in boiling water can be carried out in the presence of wetting agents and detergents of the type "Igepal," "Igepon," etc. in order to avoid scorching of oils and other difficulties.

Further wet operations should only be carried out after the preforming operation. These operations should be carried out at least 10 to 15°C. under the temperature of the preforming process in order to avoid the previously mentioned difficulties of shrinking, curling, etc. This is analogous to the procedure used for acetate crepes.

For pre-cleansing the usual detergents can be used; this operation can be carried out in alkaline baths because polyamide fibers are stable to alkali. In order to obtain level dyeing a thorough pre-cleansing is necessary, particularly, when one uses "Celliton" dyes which have affinity for fats and oils.

Bleaching of polyamide materials is in most cases unnecessary, for these materials are very white as they appear on the market. Furthermore, the usual bleaching methods, for example, with hydrogen peroxide or hypochlorite, are not effective in polyamide fiber. In mixed fabrics in which the mixed fiber must be bleached the well known bleaching methods can be used since polyamide fibers are stable to chlorine and hydrogen peroxide in the concentrations used in the bleaching bath. If it is necessary to bleach polyamide fibers, the literature reports that permanganate or sodium chlorite can be used.

We shall now turn to the dyeing of polyamide fabrics.

Acetate Dyes

Our laboratory results and also practical results, especially in America, have shown that acetate dyes such as "Celliton" and "Celliton Fast" dyes are most suitable for the dyeing of polyamide fabrics. The methods used for acetate fabrics are used. Soap, for example, Setamol WS or other dispersing agents, is added and where pre-steaming has been carried out at 100°C. the dyeing operation is carried out at temperatures of 85-90°C. Where the pre-steaming operation has been carried out under pressure for example, as often is the case with hosiery, the dyeing is carried out at a higher temperature. The "Celliton" dyes dye very level and have good affinity for the fiber. This class of dyestuff is particularly useful where there are differences in the fiber, in draw ratio or especially in differences in the ability of the fiber to absorb acid. These dyes show good leveling properties because they are taken up by the fiber by a solution process which does not depend on the chemical nature of the fiber.

"Celliton" dyes often dye polyamide fabrics in other shades than those found on acetate fabrics so that, for example, oranges appear redder and violets and reds appear bluer.

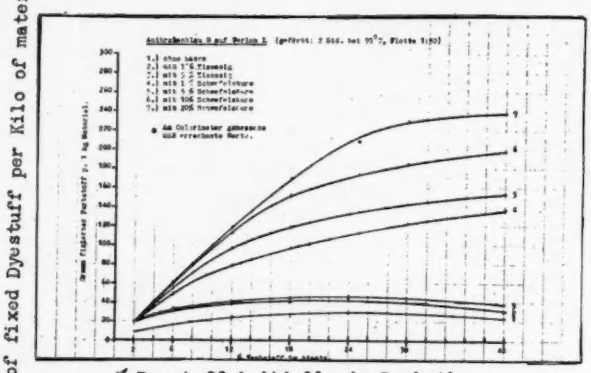
The wet fastness of the "Celliton" dyes are, in most cases, very good, being similar to that of the dyes on acetate. However, the light fastness is different and may be poorer on polyamide fiber than on acetate although many dyes have equal light fastness on both fibers. For this reason it is necessary to carefully choose the dyes used.

Among the acetate dyestuffs, certain "Cellitazoles" are of interest. These are diazol colors which are applied to the fiber by the same process as used with acetate and show on polyamide fibers essentially the same properties. Of particular importance is "Cellitazole" Black STN which produces a beautiful black of excellent fastness properties. However, the diazotization and development process must be carried out under somewhat more careful condition than normally used for acetate fibers.

Acid Dyes

Besides the acetate dyes, acid dyes are of some interest in the dyeing of polyamide fibers. Most acid wool dyes have very good affinity for Perlon fibers when they are dyed from weakly acid or sometimes from strongly acid dye baths. There are also certain dyestuffs which dye even from neutral baths although there are other wool dyes which because of their poor affinity are entirely unsuitable for the dyeing of Perlon. The behavior of acid dyes and of substantive dyes, that is their rate of absorption and their saturation point, depends on their constitution. The ability to absorb dye is also depend-

ANTHRALAN BLUE B ON PERLON L
(Dyed 2 hours at 90°C, Dyebath 1:30)



Grams of fixed Dyestuff per Kilo of material

% Dyestuff initially in Dyebath

1) Without Acid
2) With 1.5% Glacial Acetic Acid
3) With 5% Glacial Acetic Acid
4)-7) With Sulphuric Acid
• Measured and Calculated by Colorimeter

ent upon the pH of the dye bath. In general the greater the affinity of the dye bath the greater amount of dyestuff to be absorbed. For example, the absorption curves of "Anthralan" Blue B are shown from which one sees what an astonishingly high quantity of dyestuff can be absorbed by the polyamide fiber at high acidity.

The dyestuff absorption is also determined from the ability of the polyamide fiber to combine with acids. For this reason it is very difficult to obtain level dyeing when there are variations in the ability of the fiber to combine with acids, that is, variations in the number of free amino groups in the fiber. It has already been mentioned that in such cases "Celliton" colors are much more suitable because their behavior is not dependent on the chemical character of the fiber and therefore level dyeing results. Great difficulties can occur with combinations of several acid dyestuffs because of differences in rate of absorption and saturation point of the dyestuffs. Many dyestuffs are rapidly taken up by the fiber at the expense of others so that the slower dyeing colors are no longer taken up because of saturation of the limited number of free amino groups of the fiber. As a result of this it is possible to have a combination of certain blue and yellow dyes which as individual dyestuffs have good affinity, yet in mixtures only one component is taken up and the other remains in the dye bath. A typical example of this is a mixture of "Anthralan" Blue G and "Anthralan" Yellow G. If, in this mixture, the less suitable "Anthralon" Yellow G is replaced by a more suitable dye, for example "Anthralan" Yellow GG, then both components are equally taken up by the fiber. However, the degree of absorption of both dyes can be greatly altered by increasing the amount of acids in the dye bath. It is indeed possible, by the use of high acid concentration, to dye successfully with incompatible dyestuffs. However, this causes other leveling difficulties and it is advisable to use combinations of carefully chosen dyestuffs when dyeing with mixtures. It is best to choose dyestuffs for combinations which have approximately equal rate of absorption and equal saturation point.

Most acid dyestuffs are tightly bound on the fiber. Therefore it is difficult or almost impossible to obtain a level dyeing by long handling at high temperatures once an unequal dyeing is obtained. For these reasons it is recommended that dyeing be carried out carefully, the initial dyeing being carried out with ammonium acetate or ammonium formate followed by acetic acid and, where necessary, finally to add formic acid or sulfuric acid portionwise.

Corresponding to the tight combination of the dyestuff on the fiber, the wet fastness, as well as water, washing and fulling fastness of many of the acid dyestuffs on polyamide fibers is very good and is better than on wool. The light fastness of acid dyestuffs is in general very good and in some cases better than on wool.

With respect to fastness properties, acid dyestuffs are therefore, of great interest for the dyeing of polyamide fibers. However, there is little practical experience here to decide whether it is possible to obtain level dyeing with dyestuff mixtures by the addition for example, of dyes to the hot acid bath. However, the experiences in America with these dyestuffs have not been altogether satisfactory.

In the dyeing of polyamide staple in combination with other fibers, for example with wool, or with cellulose staple, many difficulties such as variation in dyestuff absorption of the fiber are of no importance. For this reason dyeing of such mixed fibers with carefully chosen mixtures of acid dyestuffs with the necessary precautions is entirely possible.

The "Palatine Fast" dyes, which are chromium complexes of suitable acid dyes, for the most part, dye polyamide fibers well. These are dyed at 90°C. with the addition of sulfuric acid. With respect to their leveling properties these colors are similar to the acid dyes for they also chemically combine with the fiber. With "Palatine Fast" colors, dyeings of very good light fastness are obtained which have wet fastness properties adequate for most purposes.

Chrome Colors

It is interesting to note how the chrome colors behave on polyamide fibers. Previous experiments have shown that the use of this type of dyestuff with a prechroming procedure is, in general, not satisfactory. Apparently the chroming of the polyamide fiber does not proceed normally. Dyeing with top-chrome colors is also not in general, satisfactory. With many such dyes the top-chroming does not proceed normally or only partial chroming takes place. This appears to be connected in some way with the combination of the dyestuff with the fiber. There are, however, many top chrome colors which chrome normally and which give dyeings of very good fastness properties. With respect to leveling properties, these colors behave the same way as acid colors. Metachrome colors are similar to the top chrome color in their behavior.

Substantive Dyestuffs

Another important group of dyestuffs which should be considered for polyamide fibers are the substantive dyestuffs. As we have already pointed out, most substantive dyestuffs very likely combine with the fiber in the same manner as acid dyes and in the same way a number of substantive dyes also are combined with animal fibers such as wool and silk. Substantive dyes which have affinity for the latter type of fiber are therefore particularly suitable for the dyeing of polyamide fabrics. With respect to the leveling and combining properties of these dyes, the same difficulties are encountered as in the case of acid dyes. Most substantive dyes are not absorbed from neutral baths and at most, merely tine the fiber. By the addition of "Katanol," good white "resists" on Perlon fiber can be obtained which is of interest for the dyeing of mixed fab-

(Continued on Page 223)

Proceedings of the
American Association of Textile Chemists and Colorists

APRIL 21, 1947

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EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass.

47-25

Education: Lowell Textile Institute, graduate, textile chemistry and dyeing, 1932.

Experience: Eight years textile chemist and colorist in print works; inspector for Quartermaster Corps, Army of U. S.

Age 36; married; references; position as chemist or salesman in New England preferred.

47-26

Education: High school, with college extension courses.

Experience: Nineteen years with two companies, mainly skein dyeing, various fibers, in charge of department.

Age 39; married, references; will work anywhere in U. S.

Light Fastness Standards

THE original Light Fastness Standards published in the 1944 Year Book, Page 185, were modified when the final Dyed Standards were put out in March, 1945. The Standard Dyeings as published at that time and now in use are as follows:

These standard dyeings have been prepared by an entirely different method than was used for the earlier light fastness standards. The principle involved is that wool fibers dyed with a fugitive dye and fibers dyed with an extremely fast dye can be mixed in different proportions so as to give almost any degree of light fastness, with only two dyeings and two dyes being used.

The dyes selected for this purpose were Erio Chrome Azurole B for the fugitive dye and Indigosol or Algosol Blue AGG for the past. A sufficient quantity of wool fiber was dyed on a mill scale with each of these two dyes so that it is the same identical blended batch used in all the standards. L2 is a straight dyeing of Erio Chrome Azurole B and L8 is 95% of the Indigosol or Algosol Blue AGG dyeing. The standards in between are varying mixtures of L2 and the fast dyeing. L1 has been omitted as being non-essential.

The two components of these standards were dyed as follows: For the fugitive part .4% of Erio Chrome Azurole B, Colour Index No. 720 together with 10% Anhydrous Glauber's Salt and 4% Acetic Acid, 80% strength was used. The dyeing was top chromed in the same bath, using .5% of Sodium Bichromate.

The fast portion was dyed using 3% of Indigosol or Algosol Blue AGG together with 5% of Ammonium Sulfate, followed by 3% Acetic Acid, 80% strength. The oxidizing bath was made using 1.5% Ammonium Sulfocyanate, 2% of Sodium Bichromate, and 10% Oil of Vitriol. The wool was rinsed and neutralized using Soda Ash and again rinsed.

Starting with No. 8 which calls for 5% of the more fugitive dyeing, equal per cent increments were used up to 100% for the No. 2, in blending the wool to make the cloth standards.

	L2
Erio Chrome Azurole B.....	100%
Indigosol or Algosol Blue AGG.....	0%

A complete set of these dyeings may be obtained from the Secretary of the Association for two dollars a set.

(For further details see AMERICAN DYESTUFF REPORTER, January 17, 1944.)

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Membership Applications

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APPLICATIONS FOR TRANSFER TO SENIOR MEMBERSHIP

Paul O. Anderson,, Russell C. Bruck, Charles J. Conner, Caddy G. Herrick, Hulett L. King, George J. Mandikos, Rodrigo Uribe.

Meeting, Southeastern Section

THE Southeastern Section had a most profitable meeting on March 22 at the Ralston Hotel in Columbus, Georgia.

The meeting was presided over by A. K. Haynes. W. B. Griffin introduced Adam Fisher, who in turn introduced the speaker.

George A. Slowinske, of E. I. du Pont de Nemours & Co., talked on the "Role of Fabric Construction in Performance of Rainwear." His talk was illustrated by slides and samples. He explained the usefulness of the Du Pont developed machine for measuring the amount of water under a definite head of pressure passing through a fabric.

L3	L4	L5	L6	L7	L8
60.7	36.84	22.36	13.57	8.24	5
39.3	63.16	77.64	86.43	91.76	95

Seventy-two people attended the meeting.

Respectfully submitted,

HOWARD M. WADDLE, *Secretary*

CALENDAR

EXECUTIVE COMMITTEE ON RESEARCH
Meetings: May 1 (Lowell, Mass.); June 4.

COUNCIL
Meeting: June 6.

RESEARCH COMMITTEE
Meeting: June 6.

NEW YORK SECTION
Meeting: May 2 (Swiss Chalet, Rochelle Park, N. J.)
Outing: June 20. (North Jersey Country Club).

RHODE ISLAND SECTION
Meeting: April 25.

PHILADELPHIA SECTION
Meeting: May 23.
Outing: June 13. (Atlantic City Country Club).

NORTHERN NEW ENGLAND SECTION
Meetings: May 16, September 26, November 21.
Outing: June 13.

PIEDMONT SECTION
Outing: June 20 and 21. (Ocean Forest Hotel. Myrtle Beach, S. C.)

MID-WEST SECTION
Outing: June 21. (Lake Lawn, Delavan, Wis.)

SOUTHEASTERN SECTION
Meeting: June 7. (Atlanta, Ga.)

NATIONAL CONVENTION
October 23, 24, 25. (Congress Hotel, Chicago, Ill.)

149th Meeting of the Research Committee

December 14, 1946, Hotel Statler, Boston, Mass.

LOUIS A. OLNEY
Chairman of the Research Committee, Presiding.

AFTER introductory remarks made by Dr. Olney, which were not reported stenographically, he introduced Leonard S. Little, who reported as chairman of the Executive Committee on Research. Mr. Little's report was published in our issue of January 27th. Dr. Harold W. Stiegler was next introduced and presented the following report as Director of Research:

Report of Director of Research

Dr. Stiegler: Under the catalytic chairmanship of Leonard Little, the Executive Committee on Research, consisting of President William D. Appel, Dr. Louis A. Olney, J. Robert Bonnar, Thomas R. Smith, and P. J. Wood, met frequently and gave much time and effort to the supervision of our research policies.

During the past year the research organization was built up to a total of twelve as follows: G. Robert Thompson, Research Associate and manager of the Lowell Laboratories; Lester Bailey, Research Associate and former Lieutenant Colonel, Chemical Warfare Service, at present in charge of our Quartermaster OD. No. 7 project; Edwin Johnstone, Research Associate on the Chemical Corps project; George Mandikos, Research Assistant on the Water Resistance of Fabrics project; Roger Griffin, Jr., Research Assistant on Dimensional Restorability and Perspiration projects; Miss Jeanne Bull, Research Assistant assigned to the Wash Fastness Committee work under Charles W. Dorn in New York; Miss Rita Landry, Research Assistant on the American Viscose Company fellowship working on Dimensional Restorability and Perspiration test methods; Professor Mary Shelton, supervising work for the Wash Fastness Committee at the University of Tennessee; Mrs. Vesta Roy, Technician; Miss Lorraine Marchand, Secretary; and John Ruskey, Laboratory Assistant.

The staff will be expanded as rapidly as possible. At present an assistant director of research is being sought and another chemist is needed for the Chemical Corps project. A new secretary is being sought.

Work on some projects has been severely handicapped by lack of availability of specially qualified chemists, unavailability of equipment and apparatus on the market.

Laboratory and office space has been generously provided by the Lowell Textile Institute and a most cordial and mutually friendly relationship exists between the Institute and the Association. The courtesy of the State of Massachusetts, the trustees, and the sympathetic interest of President Kenneth R. Fox are gratefully acknowledged. Office space was increased and more laboratory space was made available. During 1946 the large Standard Conditions Laboratory was completed and is well equipped.

Parts I, II, and III of the yearbook are the responsibility of the research organization and under the experienced tutelage of Professors Olney and Chapin several members of the staff were trained in the tedious and exacting work of lining up and editing the material so that an early deadline was met and the manuscripts delivered to the publishers and printers. Few of our members realize the tremendous amount of work involved in gathering the material, preparing and proofreading reports, and correcting and bringing up to date our procedures and test methods.

Research Projects:

I. The principal research problems under active investigation in the Lowell Laboratories are as follows:

(1) Detergency.
(2) Water Resistance of Fabrics.
(3) Perspiration Test Methods.
(4) Dimensional Restorability and Shrinkage.

The status of these is as follows:

Detergency: The Detergency Comparator of the Committee on Detergency has been developed and tested. The machine may be seen in operation in the Research Committee Exhibit and the work will be reported in detail at this meeting. This project will be continued in 1947 and should be of great service to industry.

Water Resistance: A comprehensive comparison of about a dozen commonly known and used test instruments and methods is nearing completion. The object is to find out which method or combination of methods is best suited for accurate evaluation and end-use of repellent fabrics. This work will be concluded, but undoubtedly other problems in this field will arise and receive attention. In addition a study was made of the influence of moisture content in the fabric at the time of test on the final results. This work was completed with surprising results in some cases. All of the work in the field of repellency should help in advancing and establishing uniformity, reproducibility, and accuracy in the testing of fabrics. Such testing should be on a sound basis and properly interpreted.

Perspiration: A study was made of (1) our present standard method of test; (2) a modification of this method designed to increase reliability and accuracy; and (3) a study of the glass plate method. The three methods are similar in a general way, when considering results obtained on ordinary fabrics, but the plate method offers great promise for testing pile fabrics and heavy or ribbed fabrics such as corduroys, velveteens, etc. Since the work on perspiration involves both bleeding of colors and change of shade, the work will be continued and tied in with the development of charts or instruments for evaluating small changes in shade. A crude and preliminary experimental device for the plate method is on display in the exhibit room. Refinements are being worked out. A subcommittee has been organized to cooperate in the work and in the completion of the problem.

Dimensional Restorability or Shrinkage and Stretch of Fabrics: This subject is of great importance, especially in the rayon field. The study of the machine now on exhibit will be continued, and new instruments and methods are being planned.

II. Research contracts and projects as-

signed elsewhere:

(1) *The Quartermaster Project* has the objective of attaining an OD No. 7 shade on cotton of maximum fastness to destructive agencies. This is a $25,000 contract for one year and involves the controlled processing of 20,000 yards of fabric in various mills through twelve different methods of prepare, and four methods of dyeing, using two dye formulas. Part of the preparation phase has been completed and the dyeing of the cloth is under way. The results of the work will show the influence of each step in the preparation and dyeing on the fastness of the final shade and should be of great interest and value. An excellent steering committee of experts representing a cross section of the textile processing industry has closely followed this project.

(2) *Chemical Corps Project*: This project covers a period of two years at $20,000 per year.

(3) *International Salt Company Project:* This project is for $10,000 and has the objective of determining the possible interchangeability of sodium chloride and sodium sulfate in dyeing. The long unanswered question poses a difficult problem. It has been assigned to Professor Ewing of the Department of Physical Chemistry at Lehigh. Preliminary searches and work have been done and purified dyes and wool are now being used in the investigation. Again exceptionally competent advisors are working as a steering committee to cooperate on this project.

(4) *Glycerine Survey:* The Association has agreed to make a survey of the consumption of glycerine in the textile industry for the Glycerine Manufacturers' Association.

Committees: Cooperation between committees and the research organization has been of high order and mutual advantage. The many subcommittees of the Research Committee continue their work. The facilities of the Association's research organization and laboratories are available to these committees for investigation and for coordination of work.

AATCC Sections and Research: A most encouraging feature has been the lively interest and determination of the various sections of the AATCC to organize and prosecute researches of specific value to industries within their areas.

Other Associations: Liaison was maintained with other scientific, technical, and trade associations so that broad contacts were available to handle the ever increasing necessity for coordination of effort and interlocking problems.

Future Plans: It is desired to emphasize that the objectives of the Association's research program are not limited to just the field of testing and standards, although this effort has been a major necessity. The entire field of wet processing of textiles is open to us and it is our firm intent to open investigations in the processing, dyeing, and finishing of textile material.

* * * *

Dr. Olney: In my introductory remarks I stated that this is the twenty-fifth anniversary of the Research Committee as well as of the Association. This equally applies to our Wash Fastness Committee, because that was the first committee organized and that was done at our first Research Committee meeting. Mr. Amsden was the first chairman. Unfortunately, he died within two years and the work was then taken up by George A. Moran, who remained chairman something like twenty-three years and was very active and did a lot of extremely conscientious work.

As I sat here I was reminded of an incident that occurred not many years ago. There was a meeting over in the Pennsylvania Hotel, I believe, called at two o'clock of some converters, salesmen, and what not. They adjourned at five o'clock and in the paper the next morning there was quite a complete statement that they had formulated a complete set of tests for wash fastness, light, and so forth. We have been working on that for twenty-five years, and sometimes we think we are farther away from an entirely satisfactory solution than we were to start with.

Charles W. Dorn has been chairman of that committee now for three years. He and his associates have done an enormous amount of work. I wouldn't say how many samples have been comparatively washed. I think he will tell you. If we should figure the cost of the work that has been done on wash fastness during twenty-five years, I think it would amount to $100,000. If you count the value of materials, time and effort men have put into it, plus the amount we have spent in actual dollars, I have no doubt but what it would be easily figured up by an auditor as amounting to that much.

I am rather optimistic, but I am not optimistic enough to think that I will be here when the fiftieth anniversary comes, but I have no doubt but what the work of this wash fastness committee will be going on at that time.

Now we are going to hear from Mr. Dorn.

Wash Fastness Committee

Mr. Dorn: The wash fastness committee has been extremely active during the past year. I told you some time ago, I think at the last large research meeting similar to this, that we had handled about forty thousand samples up to that date. That quantity has increased now to about seventy-five thousand. That includes the samples from the cotton study, the samples from the rayon study, and the samples from the hosiery study. The committee has not as yet started the wool study which it hopes to do very soon.

In this work we have had the cooperation of a number of power laundries. We started out with a list in cottons of twenty-five. We have received fifteen lots of samples back to date and they are still coming in. It has been a very slow operation to get those samples back.

We have had cooperation from a number of universities. The University of Tennessee has been very active in the rayon study under the direction of Miss Mary Shelton.

The hosiery work was done in the South under the chairmanship of Henry Dixon. I am very sorry that he is not here today to make a report, but Charles Seibert will report for him.

I think it would be better for you to hear these reports of the various sections from the men who have been in charge of that particular work. We have encountered difficulties again, and very serious difficulties, and I think that Charles Seibert will be able to explain them to you.

First of all, however, I want you to hear a report on the rayon study from the chairman of that subdivision, Arthur Wachter.

Rayon Division

Mr. Wachter: Dr. Olney, Mr. Chairman, and gentlemen, the rayon section of the wash fastness committee came into being just about nineteen months ago, and I have to submit the following as the report of our activity:

Our first and our most difficult task was to procure a sufficient quantity of marketwise fabrics made from synthetic yarns or fiber. We were successful in obtaining sixteen different types of popular fabrics. Eleven were constructed from viscose type rayon, four from the acetate type of rayon, and one from the cuprammonium type of rayon.

Six of the fabrics were dyed with vat dyestuffs; two were discharge printed, while two others were application printed and another was dyed with a naphthol color. The balance, or five fabrics, were direct dyed.

These fabrics were all cut into two and a half yard lengths and each of these lengths was then indelibly marked into

squares according to the template which was furnished us by the cotton section of this committee. The rayon section followed the same marking procedure which had previously been used by the cotton section with the result that our various fabrics produced some thirty odd test bundles for our laundering studies.

We again followed the cotton procedure and wrote to over thirty laundries, soliciting their aid in this study. We were rewarded by securing the fullest cooperation from eight and these eight laundries have since received one test bundle each.

We also sent seven test bundles to Miss Mary Shelton, associate professor at the College of Home Economics, University of Tennessee. Miss Shelton will process one bundle by using a home type laundry machine. She will process five bundles in the Launderometer in accordance with CS-59-44, and in this study she will introduce several variances with and without the use of steel balls. She will also process one bundle by the use of the Weatherometer.

This makes a total of fifteen test bundles which this committee has to date delivered to cooperating agencies.

We still have seventeen bundles which are ready for distribution, but because of the confusing inconsistency of laundering procedures and their equally confusing results, we have held these up, pending some clarification from our steering committee.

Charles Seibert will discuss these inconsistencies in detail.

Mr. Dorn: And now reporting for the cotton section and for Mr. Dixon of the hosiery division, Charles A. Seibert.

Incidentally, I am finishing now my third year as chairman of this committee and under the three-year rule, Mr. Charles Seibert will take over the chairmanship of the wash fastness committee as of the first of the year.

Mr. Seibert: This committee having reached voting age, I shall take the liberty of referring briefly to some of its history. The committee was formed in 1922 with George A. Moran as chairman. Mr. Moran, recently deceased, served as chairman for twenty-two years consecutively, a record that probably will not again be equalled.

The first methods for testing the fastness to washing of colored textiles were established by this committee in 1925. These tests were made with the fibers in the form of braids. Tests for fastness, to be made in the Launderometer, together with standards for grading, were established in 1930.

The standards for grading were made available to the textile industry in 1935 or 1936.

This committee was enlarged with Charles W. Dorn as chairman in 1944 and this was done principally to undertake the study on which we are reporting at this time, and which has been under way for about two and a half years.

This committee is composed of four divisions concerned with: cotton and linen, hosiery, synthetic fibers and with wool.

Its activities are directed by a steering committee of ten members, and the entire members number forty-two with about ten additional persons who receive copies of meeting notices and reports.

The present study was undertaken because the committee had been furnished evidence that the No. 3 test for cotton and linen was not severe enough to predict reliably the practical performance of improperly processed textiles, in some instances.

After a lengthy discussion between the committee and representatives of the various sections of the textile industry concerned with wash fastness, it was decided to thoroughly investigate the entire subject of the wash fastness of all colored textile fibers in order to learn how the present test methods compared with home and commercial laundering.

To do this most thoroughly and expediently, it was decided to divide the work into the four divisions already named. The division to study woolens has not been named, principally because the fabrics required for the work have not been available. However, that division will start its work within the next three or four months.

The division concerned with cotton and linen was formed first, followed by the hosiery division and then the synthetic fibers division.

Cotton Division

The program of the cotton division started with the selection of forty-one samples of dyed and printed fabrics. More would have been included had they been available.

A minimum quantity of one hundred yards was required of each sample. All of this quantity was not required for immediate use and some has been preserved for work to be undertaken to provide revised test methods in the event that the practical tests indicate that as necessary or desirable.

The fabrics were carefully selected to include some colored with different classes of dyes and different physical constructions to represent an average of what had been in general use for several or more years and that were expected to be in use for the immediate future, at least.

Men who have been intimately concerned with previous surveys to learn the effect of home and commercial laundering on colored textiles are members of the steering committee and they were responsible for the selection of the fabrics and for the selection of the commercial laundries to be representative of average laundering conditions in the United States.

A letter was sent to more than 30 commercial laundries describing the program and its purpose. Twenty-two agreed to subject the 41 samples to 30 consecutive washings.

A 2-yard piece of each of the 41 samples was sent to each of these 22 commercial laundries together with a mimeographed copy of instructions and a mimeographed copy of a questionnaire for information on the washing procedures in detail.

Each sample was marked to indicate the part to be removed after each individual washing. The pieces to be removed after the 1st, 5th, 10th, 15th, 20th, 25th, and 30th washing were larger than the others in order to have a sufficient quantity of these to make tensile strength tests.

The laundries were not requested to use any particular washing procedure. They were merely requested to divide the samples into groups as they would if the fabrics came to them for laundering in the form of finished articles and then to launder them as they would normally.

Eleven of the commercial laundries completed the work; however, it required more than a year for them to do it. Several letters and in some instances phone calls and personal visits were used to induce more of the laundries to complete the work, but without success.

In addition to the commercial laundries, 6 members of the steering committee have subjected the samples to 30 or more consecutive washings under conditions planned in advance to provide a wide range of useful information. Some of these tests were made in the Launderometer and some in different types of home laundry washers, such as the Bendix, the agitator and wheel types.

Some tests were made comparing the effect of drying in bright sunlight with drying protected from strong light. These disclosed that it required at least 5 washings before there is an easily noticeable difference in the effect on the colors. In these tests, that represented 30 hours of exposure in strong sunlight, facing south and during the months of July and Au-

gust 1945. However, some allowance must be made for the fact that the tests were made in a location near a large power plant burning 2000 tons of coal daily, under forced draft. Yet during the drying after these first 5 washings, the sun was shining brightly, although that was not always the condition during the drying following the entire 30 or more consecutive washings. However, a careful record has been kept of the conditions during drying for the entire series of tests.

The tested samples have been compared for color change, and tabulations of the effect after 1, 5, 10, 15, 20, 25, and 30 washings prepared. This together with the information on the procedures used by the laundries and other pertinent data is an 80-page report.

As is to be expected, the washing procedures used by the commercial laundries vary widely. The greatest differences in temperature are between tap water, assumed to be between 70 and 80 and 160° F. The times of treatments in the soap liquors, the number of treatments in the soap liquors, the number of rinsings, their times and temperatures also vary as do other conditions that influence the degree of color change and loss.

The white parts of some of the samples are seriously stained by soil removed from garments and fabrics with which they were laundered.

Outstanding color changes have occurred in some of the samples treated by some laundries whereas no color change has occurred on these identical samples treated by other laundries using a relatively similar procedure.

These wide variations in color losses and changes have made it very difficult to select the average effect on each individual sample.

No one laundry could be accepted as representing an average by the most liberal interpretation of the results. We tried several different systems for evaluation without arriving at any logically acceptable result.

As some brief illustrations: in the work of laundry D we could accept 19 of the samples as being average; in laundry E, 17; laundry GH, 25; laundry H, 11; I. 4; M, 19; N. 15; O, 7; R, 6; V. 20; and Y, 25.

When the solid colors and printed patterns are considered as separate groups, the number of samples representing averages, are entirely different for the two groups and different than the figures described.

On suggestion of J. A. Stevenson, one of the committee members, we tried to select an average washing procedure, but this was almost as difficult as trying to select an average of the effects on the colors. However, with the aid of Ralph B. Smith of the New Jersey Laundry-owners Association, and with some logical and minor changes, we selected a washing procedure and then subjected the 41 samples to 30 consecutive washings under carefully controlled conditions and under the immediate supervision of Mr. Smith and Miss Jeanne Bull, the research associate assigned to aid the work of this committee.

The fabrics were carefully divided into suitable groups and then laundered with full wheel loads of similar fabrics sent to the laundry for normal processing. Much to our disappointment, in these tests all of the fabrics showed a greater color loss than what we had selected to represent the average for the 11 commercial laundries.

We found that a full wheel load as used by this laundry represented a very small liquor volume ratio to weight of fabric. We then repeated some of the work using double that liquor volume ratio.

This series of tests shows somewhat less color loss than the series with the leser liquor volume ratio; however, it is still greater than the average we had selected for the 11 commercial laundries.

We next compared the average we had selected for the 11 commercial laundries with the effect of similar numbers of treatments in the Launderometer by our present No. 3 wash test for cotton and prepared a tabulation which is another report consisting of 42 pages.

However, this comparison is acceptably indicative of the fact that the present No. 3 test should be increased in severity to produce results more reliably indicative of practical performance.

We have already tried various means to secure this increased severity in the Launderometer using different types of metal jars kindly furnished by the Atlas Electric Devices Company, the manufacturers of the Launderometer.

In previous studies we had made many tests with the test specimen prepared in the form of a bag, with balls inside the bag and outside in the jar. At that time we had criticism of that method because of the time required to prepare the bag form test specimen. However, this method is used by a member of the steering committee for the evaluation of the wash fastness of dyed and printed materials representing several millions of yards of fabrics yearly, and with acceptably reliable results during a period of at least 5 years.

We have recently made many tests with the test specimens in bag form and under varying conditions, including changes of speeds of the Launderometer between 25 and 60. The normal speed is about 42 RPM.

We have tried many different forms of attack to secure greater abrasive action with more planned. We are having the glass jars sand blasted on the inside to secure a rough surface.

The evidence that has accumulated indicates that corrugations with a smooth surface, such as in the form of a glass wash board, do not provide the type of increased abrasion that is required. The surface that will probably provide the desired result will be uneven in character and uneven in pattern. The surface of the test specimens themselves under the proper conditions of agitation appear the most promising means yet uncovered. As an illustration, under identical conditions, where the cloth itself supplies the abrasive action, we have found that a 10 minute treatment in an agitator type of home washer produces as much color loss as a 45 minute treatment in the wheel type of washer. However, these experiments were made with a liquor volume ratio to weight of cloth between 25 and 75. It is doubtful that this condition will exist in liquor volume ratios of between 2 and 8/1.

Some of the purely mechanical tests required to provide increased abrasive action will be done at Lowell, while the committee continues its work with that and other conditions to be explored.

The tensile strength tests have been completed by the research associate. Their interpretation and tabulation will be the subject of another report in the not too distant future.

In closing the report for the cotton division, some recent mental calculations by the committee chairman indicate that approximately 70 thousand individual samples have been subjected to wash tests thus far in this study and the tensile strength tests number several thousand.

Evaluations and tabulations of the results of the tests are a tedious task. That part of the work is largely the responsibility of the research associate, the committee secretary, and Mrs. Winifred N. Pardey of the color fastness department of the laboratory of the General Dyestuff Corporation. The secretary gratefully acknowledges their excellent contributions.

Hosiery Division

The hosiery division is composed of 6 members. Four including the chairman,

Henry B. Dixon, are practical commercial hosiery dyers and finishers. Like the cotton division their program was to learn how dyed hosiery was effected by commercial and home laundry washing and to compare the results with the AATCC No. 1 and No. 2 wash tests for cotton.

They proceeded by selecting good grades of mercerized and of plain combed cotton yarn similar to that used for good grades of hosiery and had a large quantity knitted into tubing.

They then selected 7 colors that are in continuous demand for men's and children's stockings. The colors are a red, a royal and a navy blue, a red and a green shade of brown, a grey and a black.*

Three of the practical hosiery dyer members of the committee dyed quantities of the tubing to duplicate the 7 colors, using dyes that are generally known as commercial colors and the dyes that they normally use.

The fourth practical hosiery dyer on the committee duplicated the colors with dyes to provide the best wash fastness generally available from commercial hosiery dyers. These dyes are generally known as of the aftertreated class.

The laboratories of 4 dye manufacturers were requested to duplicate the colors to provide the best possible wash fastness regardless of the class of dyes used.

One used dyes aftertreated with formaldehyde, another dyes of the developed class principally, the third used vat dyes and the fourth some aftertreated with formaldehyde, some developed; for one color, sulfur dyes, and for some other colors, azoic dyes that are formed on the fiber in two separate operations.

Liberal portions of all of these dyed samples were submitted to the Good Housekeeping Institute for repeated washings in a home type laundry washer and by washing procedures that they have learned from previous surveys represents the average home laundry procedure.

Liberal portions were sent to the American Institute of Laundering for 20 repeated washings by procedure representing good commercial laundry washing practice.

A third group of these samples were subjected to 20 repeated treatments in the Launderometer by the AATCC No. 2 wash test for cotton.

In all of these washings, pieces of white cotton were added to illustrate bleeding and staining.

The results of many of these wash tests are illustrated in the loose leaf binder already exhibited.

The conclusions that may be drawn from this work are:

1. Both in commercial laundries and in home washers stockings are washed at temperatures of about 105° F. If the washing is done by hand the temperature may be expected to be about 105° F. also, because temperatures above 110° F. are uncomfortable on the wrist and hands and the higher temperature quickly produces reddening and roughtening of the skin which the average person avoids.

2. The Good Housekeeping Institute made some tests at 120° F. and report very little difference in the effect on the colors; however, the treatments in the soap liquors were for between 3 and 5 minutes.

3. Their tests confirm the established fact that mercerized cotton withstands washing with less bleeding than plain cotton.

4. The AATCC No. 2 wash test for cotton is too severe for cotton hosiery. The temperature of 120° F. causes a greater degree of bleeding and staining than commercial and home laundering and also a greater loss in color. The 30 minute time of treatment may be justified if it can be illustrated that these conditions produce results that are comparable with some numbers of repeated washings made under practical conditions. However, the work so far completed indicates that the results are not comparable.

5. The work thus far reported was completed by the hosiery division about one year ago and the work is now underway by the research associate under the direction of the steering committee to learn how commercial and home washing compares with the AATCC No. 1 test for cotton, made in the Launderometer. This work could not be started earlier because of other activities by the research associate in connection with work for the cotton and synthetic fibers divisions and for the flammability committee.

6. The samples colored with the vat dyes are outstandingly superior to all the other samples, with very few if any exceptions.

7. The samples colored with the developed and azoic class dyes, are, in general superior to the samples colored with the class of dyes known as commercial for cotton hosiery.

9. The chairman of the hosiery division, Henry B. Dixon, has reported to the steering committee that the members of the hosiery division believe that cotton hosiery can be colored with dyes to withstand repeated washings at 105° F. in neutral soap solutions and by procedure used by the Good Housekeeping Institute and by the American Institute of Laundering and that they will approve test procedures in the Launderometer that provide results comparable with the results of the tests made by the Good Housekeeping Institute and A.I.L.

* * * *

Dr. Olney: I lectured several hours a day for forty-seven years, and I find it takes a convention like this to put your voice out of condition.

We have another very important work which is going on in the Association, and that is in regard to the subject of shrinkage of fabrics and what we have more recently described as dimensional change.

Dr. William E. Coughlin is the chairman of our committee that is taking care of that work. We will hear from him now.

Dimensional Changes

Dr. Coughlin: Mr. Chairman, ladies, and gentlemen, I don't have the past history of the dimensional changes subcommittee as did Mr. Seibert on the background of the wash fastness committee, but hearing him tell about the twenty-two years' service and the like, a record that probably will not be beat, reminded me of the cantankerous Irishman who was on his deathbed, but they couldn't keep him down at all, and his daughters went in and told him he'd have to remain quiet, he couldn't be getting up. "Why not?" he said. "Why, you've got a temperature of 104," and his only answer was, "What's the record?"

Well, that twenty-two years does sound very long for the committee to be in action. The present dimensional changes committee was formed about seven months ago and it had as its objectives the desirability of simplifying present test methods for the investigation, primarily of changeability, but also of dimensional changes in fabrics such as stretching, and also another part, to correlate the test methods that are presently in form, or those that would be proposed with the actual practice which takes place in industry.

And that, of course, involved a study of the existing test methods of AATCC as well as all other organizations, and to compare the performance in actual use of fabrics with the results predicted from these test methods.

It was found desirable to duplicate in some manner the type of action which had taken place in the wash fastness com-

(*Note: The 7 colors were exhibited in a loose leaf binder together with portions that had been subjected to repeated washings including pieces of white cotton added to illustrate bleeding and staining.)

mittee; namely, to break down the study of dimensional changes in fabrics into three sub-division studies:

1. Changes which take place in commercial laundering.

2. The study of dimensional changes in home laundering procedure.

3. Dimensional changes which take place in dry cleaning procedure, and that involves wet cleaning as well.

Recommendations for the speeding up or clarification or simplification of test methods have been made in one instance. On the basis of a considerable amount of data submitted to the committee by Mr. Clayton of Cluett, Peabody, it was recommended for inclusion in the 1946 yearbook as a tentative standard. The procedure involving the drying of the sample after laundering and then the subsequent rewetting is eliminated in favor of an extraction of the sample directly after laundering, followed by an immediate pressing while wet. That, of course, is a time consuming factor that has been eliminated and will speed up the work of testing in general.

The committee decided not to attack the problem of knitted fabrics at the present time, and I might mention that as far as dry cleaning procedures are concerned no work has been done on this subject at the present time.

George Fulton of the National Association of Dyers and Cleaners, who is the chairman of that sub-committee, has not had the opportunity to work closely with us in New York, but he is here today and immediately after the first of the year in collaboration with other committee members on his sub-committee we look forward to having some real work done on dimensional changes in dry cleaning.

Inspection of the present-day test method for predicting dimensional changes either in dry or wet cleaning as written in any of the standard procedures develops the fact that the test methods now in use do not anywhere near duplicate the methods used in the commercial dry cleaning plants throughout the country, and I imagine that problem will be attacked very quickly by Mr. Fulton.

As was done in the case of the wash fastness committee, I would like to ask the two sub-committee chairmen to make brief reports which they have prepared. The first person whom I wish to introduce to the group is Ralph Smith, Director of the Department of Engineering of the New Jersey Laundry Owners Association. Mr. Smith's name has come up previously in connection with the wash fastness committee work and when we consider that the New Jersey Laundry Owners Association is a little bit outside the sphere of our usual activity, I think that the great amount of work, time, and effort, and cooperation extended to our association by the New Jersey Laundry Owners Association in the person of Mr. Smith deserves the warm thanks of all of us. He is a conscientious, hard worker, and has done a lot of work for this committee as well as for the wash fastness committee. I'd like to introduce Ralph B. Smith.

Commercial Laundering

Mr. Smith: This report covers a very brief summary of the data which we have accumulated in washing seven of the samples which were picked out of the group of samples processed by the wash fastness committee and also on a series of rayon samples which you have already heard described. They are the same ones that were tested for wash fastness.

The committee selected seven samples from the set of forty-one pieces of material used by the committee on fastness of dyed and printed cotton for their 1944 and 1946 tests and these samples were washed thirty times in a commercial laundry with the light colored loads along with the samples being tested for color fastness. A similar set was also washed the same number of times in white work load. Analytical tests were made on both washing formulas to insure the use of satisfactory washing methods in the tests and in order that tests could be duplicated if necessary. The samples were marked with ten-inch and eighteen-inch squares and after washing and extracting, one set of samples was ironed on a flat work ironer and the other set on a laundry garment press. The samples were measured after pressing under the conditions of temperature and humidity existing at the time of test.

Fifteen samples of rayon were also washed twenty-six times with the light colored loads and were ironed and measured in the same manner as the cotton samples. The cotton samples showed warp shrinkage values between 5.0 and 13.5% and the filling varied between a gain of 6.5% and a shrinkage of 4.0.% The rayon samples gave warp shrinkage values between 2.0 and 20.0% and the filling varied between a gain of 10.0% and a shrinkage of 25.0.% None of the cotton had been preshrunk or treated to prevent shrinkage.

There was little difference in the final shrinkage or in the rate of shrinkage of the cotton samples washed in the light colored formula and in the white work formula. The most outstanding result of the test was the relative slowness with which the warp threads of the cotton samples reached complete relaxation with repeated washing. Approximately 0.5 of the possible warp shrinkage occurred in the first washing and the corresponding values for the third and fifth washings were 0.7 and 0.9. Complete relaxation of the warp threads was obtained at between ten and fifteen washings. The filling threads showed complete relaxation after one or two washings. All but one of the rayon samples attained complete relaxation after one to four washings. The one exception showed progressive shrinkage of the warp threads for twelve washings.

During 1946 Lowell Textile Institute washed five of the above cotton samples five times in a standard dash wheel and in a Launderomat. Good Housekeeping Institute washed six of these same samples once in a Launderomat and once in a gallon jar type Launderometer. These laboratories obtained somewhat less shrinkage in one wash than in the case of the same samples washed in the laundry. The same relationship held with the Lowell Textile Institute samples at the end of five washings.

The tests made during 1946 by Lowell Textile Institute, Good Housekeeping Institute and in a commercial laundry all indicate that for cotton materials of the type tested not more than about 0.5 of the possible warp shrinkage will occur in one washing. If it is desirable that a shrinkage test measure complete fabric relaxation, then some test method must be worked out which will give accurate results in a reasonable length of time. More information is needed as to the effect on shrinkage rates of such factors as mechanical action, temperature, soap and alkali concentration and the ratio of water to load, if an accurate accelerated shrinkage test is to be developed. It is planned to study this phase of the shrinkage problem during the coming year.

Dr. Coughlin: I'd like to refer to one piece of equipment, namely, the gallon Launderometer jar. It had been suggested by members of the wash fastness committee that it might be possible to carry out shrinkage investigation and color fastness to washing at the same time, and with the cooperation of the Atlas Electric Company gallon Launderometer jars which can be attached to the present Launderometer were devised. They have been in use and it is interesting to note that the degree of shrinkage which is accomplished in the agitation which takes place with your 22" jar in a gallon Launderometer jar parallels very closely that obtained from the dash wheel.

I would now like to introduce the very capable chairman of the sub-committee on home laundering procedure, Arthur J.

Heinzmann of the American Viscose Company.

Home Laundering

Mr. Heinzmann: Dr. Olney, Mr. Chairman, ladies and gentlemen, the sub-committee on dimensional changes for home laundering in its initial work has procured a Fuji type fabric and submitted, through its members, forty samples to consumers and seventeen to laboratories.

The consumer's machine washed one set of two samples and hand washed the second set of two. The laboratories tested their samples according to present test procedures under CCCT-191-A Rayon Method, CS-59-44 Rayon Method, AATCC-1945 Handbook cotton and rayon method, and two of the laboratory samples were washed in the gallon Launderometer, one at 105° and the other at 160°.

Twenty-three of these consumer samples washed and pressed under varying individual procedures showed shrinkage results to be within approximately 1% plus or minus, ten within 1.5% plus or minus, and three samples showed losses of 3.3 Warp, 2.5 Filling; 2.2 Warp, 2.0 Filling; 2.3 Warp plus 0.3 Filling respectively. However, these three samples were definitely not properly ironed after washing. The remaining four have not been returned as yet.

The laboratory results varied from 0. to plus 2.0 in the Warp and minus 0.5 to minus 2.5 in the Filling. Consideration must be given to the various test procedures employed with reference to time, temperature, etc.

It would appear that the consumer results were very consistent. The laboratory results were also consistent as to individual test methods employed.

This work was all performed on a stabilized fabric. We are now preparing samples of the same type of fabric not stabilized in an attempt to compare results. We also plan on carrying this study to a number of progressive washings and to submit additional samples to Ralph B. Smith of the New Jersey Laundry Owners Association to be run in one of his commercial laundries.

Upon completion of this preliminary work the committee hopes to be able to ascertain which of our present adapted test procedures simulates actual consumer performance results. We will then proceed to work with various other fabrics in an effort to correlate this consumer performance with results predicted in one or more of the adopted test procedures as now written or with such changes as may prove practical upon completion of our study.

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Dr. Olney: Our next report will be in regard to light fastness and Charles A. Seibert will make that report. I frequently refer to him as one of our wheel horses. You all know what that means. He has been chairman of the light committee for some time. But we have another rule that no man shall be chairman of two committees at the same time so that he has moved on to the wash fastness committee. He is therefore all washed up with light fastness, and Mr. Holst is going to be chairman of that committee from now on. But Mr. Seibert however is going to report for the light-fastness committee.

Light Fastness

Mr. Seibert: Some of you may not be acquainted with William A. Holst, technical service manager of the National Aniline Division of the Allied Chemical and Dye Corporation, and I'd like to introduce him. He will become chairman of this committee with the wheel horse remaining secretary for a little while longer.

This committee too has reached the legal voting age and some historical data on its work is appropriate. The committee was formed in 1921 or 1922 with William A. Cady as chairman. He served for seventeen or eighteen years consecutively as the chairman up until 1940 when Mr. Appel took over. He served for three years and then yours truly took over.

The first work of this committee was a study to learn what conditions influence the fading of colored textiles. This study was made with a selected range of dyes applied to wool, cotton, and silk, and a lesser number of dyes on other fibers. These test specimens were exposed to daylight and sunlight under varying conditions such as, lying horizontal, lying at varying angles from the perpendicular, facing north, east, south, and west and under glass and without cover.

This study which covered a period of five years also included exposures made only while the sun was shining brightly, only during daylight while the sun was not shining brightly, and for the entire daylight time regardless of the visibility of the sun.

Very careful records were kept of all variable conditions, such as temperature, relative humidity, hours of bright sunlight, etc.

This study also included exposures in which the test specimens were placed behind screens that filtered out ultraviolet, infra-red, and some selected parts of the rays that compose natural light.

This study disclosed that exposures made at different times, between April first and October first, and only between 9 A. M. and 3 P. M. and only when the sun was shining brightly, and with the test specimens facing south at an angle of 45 degrees from the perpendicular, produced a quantity of color change or fading, that is acceptably consistent for testing and grading the light fastness of colored textiles.

As a result of that study, the present standard method, by exposure in sunlight was recommended as early as 1925, and it still remains the method recommended by this committee as the most reliable for consistent reproducibility.

The first report prepared by this committee on its work is in the AMERICAN DYESTUFF REPORTER, issue of December 28, 1925, page 853.

During 1926, '27, and '28 work was conducted comparing sunlight with Fadeometer exposures and as a result in the 1929 Yearbook is the statement that approximately 4 2/3 hours of exposure in the Fadeometer caused as much color change as 6 hours of exposure in sunlight under the standard test conditions. That statement applies only to the Fadeometers available at that time, the FO and CV models. The later FDA-R model is faster in fading rates.

The next published report of this committee is in the June 8, 1931 issue of the AMERICAN DYESTUFF REPORTER and it is a tabulation of the fastness to light of 366 dyes applied to different fibers, and it is the result of the exposures of 1196 different test specimens.

In the 1931 Yearbook is described the first set of 6 standards recommended for grading light fastness.

In the 1935-1936 Yearbook is the first mention of the committee making available to the textile industry these 6 standards.

In 1937 William D. Appel became chairman of this committee, and in that year, as a result of previous correspondence and personal conversations between the AATCC, the Society of Dyers and Colourists of Britain, and the German Echtheitskommission, this committee approved the adoption of 4 of the German standards for grading light fastness. It did this in the belief that by this means it would be taking the first step that would lead to a later approval of an identical set of standards to serve for the United States, for Britain, and for Germany.

After more correspondence and conversations, this committee again took the lead and approved the adoption of 4 more of the German standards tentatively approved by the 3 representative groups, completing a range of 8, the number now sponsored by this committee. However, the present standards are not these 8.

The next step in the program was to prepare and make available to the textile industry these 8 standards, two of which were colored with dyes not manufactured in the United States or Britain.

At about this time conditions within Germany changed and the committee realized the advisability of using dyes for the standards that were available from more than one source. However, much work failed to disclose any suitable substitutes of domestic manufacture as replacements for these two dyes of exclusive German manufacture.

After further considerable discussion and experimental work, the committee approved the plan to blend in the required quantities, loose wool colored with a fugitive and a very fast to light dye.

The present standards have been prepared by blending loose wool dyed with Erio Chrome Azurole B, a dye extremely fast to wet processing but of rather poor light fastness with loose wool colored with Indigosol Blue AGG, an extremely fast to light dye.

As is to be expected, many experimental blends and many experimental light tests were required to achieve the desired results.

Naturally, many cooperated in this work; however, this committee owes and hereby expresses publicly to Hugh Christison its collective thanks for his outstanding contributions. His patience, his counsel and the contributions by the Arlington Mills were instrumental in aiding the committee to make these standards available to the textile industry in a relatively short time, considering the amount of work required.

These standards are 8 in number and they are designated with the numbers 1 to 8, inclusive. Each higher number is twice as fast as the next lower number.

As an illustration: Standard No. 1 serves to grade colors that fade appreciably when exposed to sunlight for between 1 and 3 hours. Standards 2 to 8 serve to grade colors that fade to an appreciable degree on exposure in the Fadeometer for between 2.5 and 5 hours; 5 and 10 hours; 10 and 20 hours; 20 and 40 hours; 40 and 80 hours; 80 and 160 hours; and No. 8, the fastest, between 160 and 320 hours.

These standards do not bleed in water and they are therefore suitable for outdoor exposure and for grading the light fastness of colored textiles intended for outdoor use.

Naturally, it is impossible for this committee to have investigated how the standards serve to grade every possible combination of dyes and their possible variations in proportions, nor their use for grading even a small number of colored fabrics when exposed to all the possible combinations of light and weather conditions; however, many thousands of exposures have been made under widely varying conditions and these have served to illustrate that these standards will fulfill satisfactorily the requirements of the textile industry for testing and grading the light fastness of commercially colored fibers and fabrics.

Industry, or at least, a large part of the textile industry is describing light fastness in terms of the numbers of hours that the color will withstand exposure in the Fadeometer, without fading to an appreciable degree. This committee and all the other committees of this association concerned with grading color fastness, realize that the term appreciable change, is subject to wide and unsatisfactory variations in individual interpretation, and without going into details, I am happy to know that it is a very active program of another of the sub-committees of the association to improve that condition.

We are all aware that Fadeometers vary in the rate at which they effect fading; however, they are very useful because their light is available at all times, and they have become standard equipment for grading light fastness in the textile industry.

Grading the light fastness of colored textiles can be done with a reliability to serve the average needs of the textile industry through exposures in fading lamps however, much of the uncertainty due to the differences in the fading rates of the individual lamps is removed, when the test specimens and the AATCC standards for grading are exposed simultaneously. This requires some space in the lamps for the standards and for various reasons some in industry prefer to use that space more profitably. It is an axiom that business must operate profitably, and it is the aim of the research committee of this association to provide the textile industry with adequate means to measure and grade the various properties of textiles as well as the materials with which they are processed.

We are not consistently in agreement with the means proposed by all in industry to accomplish their desires, nor can we be expected to provide quickly all the tools we recognize as desirable; however, we are trying.

Naturally, it would be very useful to the textile industry to have Fadeometers that are more uniform in fading rates. This committee cannot logically be expected to undertake to build such lamps, nor to inform the manufacturer how to improve them in construction to achieve that object. We are, therefore, compelled to explore other possibilities and this committee has been studying another means for the past 3 years.

This means measures the fading energy generated by the lamp and compares it with a standard quantity. As an illustration, we would first establish a standard lamp. Then expose in that standard lamp for varying numbers of hours some colored material, to be known as a control. A piece of the control would be exposed in the lamp daily and this then compared with the pieces of the control that had been exposed in the standard lamp.

Let us assume that the lamp under consideration had been operated for 20 hours. However, the control in that lamp for those 20 hours was only as much faded as the control exposed in the standard lamp exposed for 18 hours. Then the means for compensation would be to credit the test specimens with having had 18 hours of exposures instead of the 20 hours they had received.

The National Bureau of Standards has built a standard lamp, one that is consistently uniform in fading energy and while this committee had done very much work to find a suitable control and establish a standard lamp and had believed it succeeded, the National Bureau of Standards expressed the desire to continue with its work to develop and make available to industry a control. To avoid duplication of effort and confusion, this committee decided to discontinue its work on the problem more than a year ago, and has in the interval confined its efforts toward aiding the Bureau in its work.

The Bureau has already distributed to many in industry samples of its proposed control under the designation of "Calibration Paper A"; however, several members of this committee who have followed the work carefully believed the Standard Lamp to be operating with a much greater quantity of destructive energy than the average Fadeometer in industrial use.

If the quantity of destructive energy illustrated by the samples of this Calibration Paper A already distributed to industry was accepted as the standard quantity, all light fastness ratings in the color cards issued by the dye manufacturers and the standards adopted by industry and in use by some for a relatively long time period would become obsolete and the general requirements for fastness on the basis of Fadeometer hours would be very much increased. This would not serve a useful purpose, and to avoid that condition the Bureau through William D. Appel, chief of its textile section, and a member of this committee

for approximately 20 years, has agreed to establish the standard quantity of fading for different hourly time periods so that it will be in agreement with the fastness of the AATCC blue wool standards for grading light fastness.

The work required to accomplish this is under way and it is hoped by all concerned that the Bureau will be in a position to furnish industry with the control for the calibration of the fading lamps, in the not too distant future.

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Dr. Olney: Next we are going to take up a subject which has been taken on more recently by the research committee; namely, that of detergency. F. A. Prisley is the chairman of that committee and we are going to hear from him now.

Detergency

Mr. Prisley: Dr. Olney, Dr. Stiegler, ladies and gentlemen; we have no great amount of past to report here. From present indications we are going to have a long future, although I doubt if we will develop any wheel horses owing to the new regulations in the bylaws.

I will present now the formal report of the committee which at this time will follow the usual style of any report from any group working on detergency problems; that is, it will be a progress report.

The activities of our committee are carried out by two groups of which one is working on the problems of detergency as encountered in the wet processing departments and laboratories of cotton and synthetic fiber mills; the other on the same problems in woolen and worsted mills.

The cotton section chairman, V. B. Holland, reports that they have completed an investigation with reference to the evaluation of synthetic detergents as bleaching assistants in the continuous peroxide bleaching of cotton. In addition, a report has been finished on standard soils and their stability to ageing. These will be published in the near future.

These projects serve very well as examples of the kind of work to be expected from this group. They have in one case worked out a means of evaluating the efficiency of detergents in a very specific application. The other project will no doubt aid in clearing up one of the exasperating factors encountered in the use of standard soil material.

The wool section has taken for its first project the task of designing and producing a laboratory instrument, proving its precision, and then setting up a method for its use, the general requirement being that the instrument shall be the means whereby the performance of any detergent in practice can be predicted by a laboratory test.

There is a very urgent need for such equipment in the woolen and worsted industries, for, unlike the workers in the laundry field, both home and commercial, we have had up to the present no full-scale or pilot-size pieces of equipment with which to work out problems in fulling and scouring. A possible exception is the AATCC Launderometer, but that machine was designed for another purpose and even now is undergoing revision by another committee to overcome certain deficiencies.

Some workers, after a great deal of work, have found that good results could be obtained in the Launderometer, but they are in the minority.

It has also been decided that physical measurements of the properties of detergents do not give information which can be used to predict performance.

Two factors which have tended to limit the value of such devices to date are: the material to be scoured and the soil which must be removed. Since woolen and worsted fabrics include such a wide range of weights and constructions and since the soil varies so widely in amount and description, it is impossible to synthesize the soil and very difficult to standardize the fabric. For these reasons, any laboratory machine must be capable of handling the actual fabrics involved, carrying their "native soil."

The present situation in the fat market shows no sign of being temporary. These materials are widely used in combination with mineral oil because of their influence on the scourability of the wool oil. As the scarcity of them will reduce the ratio of fat to mineral oil in the fiber lubricant, the problem of cleaning the goods which in normal times is seldom a simple one will be aided greatly by the use of the Comparator.

The future work, I mean the immediate future, will be first of all to develop further the capability of the machine on heavy-weight woolens, around thirty-two ounces for which some adjustments in the machine may be necessary. We believe that on worsteds and on medium weight woolens we are quite close to the goal.

Now Clarence Nutting, who is chairman of the woolen section, will give a report which I think will bear out my statement.

Woolen Section

Mr. Nutting: Dr. Olney, ladies, and gentlemen. Last year at the annual meeting in New York City, the wool detergency sub-committee presented a new model of a machine which it chose to call a "Detergency Comparator." The machine was the culmination of the efforts of the committee to develop a machine which would enable laboratories to make better comparisons of detergents on wool fabrics than had been possible before.

At that time, the machine was so new that the committee itself had had no opportunity even to try it out on materials of wool, much less to determine whether it is versatile enough to be applicable to other textiles.

Subsequently, the comparator was set up in the Lowell Textile Institute laboratory where the committee met with Dr. Stiegler and members of his staff and started a program designed to demonstrate the utility and limitations of the comparator.

Inasmuch as the committee members were particularly interested in problems pertaining to worsteds, the program was initiated in demonstrating the effectiveness of the machine on worsted material. For this purpose, a material was agreed upon which consisted of a knitted tubing about 1¼ inches wide in the flat condition. This tubing was knitted on the Textile Institute knitting machine from a typical 2/40s worsted yarn supplied by the committee. The yarn was spun from top to which had been added the usual 2.5 to 3% of the standard mineral oil-grease oil blend approved and adopted by the National Wool Manufacturers Association.

In order to have a better visual means of observing the effectiveness of the operation of detergents in the comparator, the committee chose to incorporate a high grade lamp black in the oil applied to the top as it started through the drawing and spinning operations. The amount of lamp black used was in the ratio of 1 lb. to 3 gallons of oil blend. By applying the mixture before the drawing operation, both oil and lamp black were very evenly distributed throughout the lot of yarn.

Using this tubing and a variety of detergents, many pairs of tests were conducted which soon demonstrated the need of revision in some details of design, although basically, the simulation of the dolly type cloth washers was demonstrated as fundametnally sound for the purpose of comparing detergents, at least, on the worsted knitted fabric used.

Some earlier series of tests indicated a lack of consistency, but later experience has led the committee to feel a real confidence in the machine and a certainty that reproducible results are ob-

tainable when uniformity of operating conditions is adhered to.

Many of the members of the sub-committee on Detergency as related to wool are also members of the group that conducted the work with the comparator on which was based the paper presented in last night's contest by the Norhern New England Section. This latest demonstration of the effectiveness of the comparator was carried out following the work conducted at the Lowell Textile Institute and after the minor mechanical changes in the machine indicated by that work had been made.

The performance of the machine and the samples produced by the work for the contest paper which are on display with the machine in the exhibition room, the committee feels attest to its practicability as a detergency comparator. Reproducibility of results and consistency of total reflectance values and residues of solvent extractable material, strikingly prove its value. Its versatility and use on other materials is still to be demonstrated. This further application, at least to wool fabrics other than soft worsteds, the committee expects to consider in its later work, and it may result in still other changes in design.

In spite of the possibility of changes, it is believed that they will have to be of a minor nature only. Means for obtaining still greater roll pressure, for instance, may be required for some types of fabrics. A reduction in the retention capacity of the suds boxes beneath the squeeze rolls may be required to permit the use of shorter baths. At present, a 6 to 1 bath ratio is about the minimum that can be used in the comparator whereas mill practice is generally considered to be somewhere between a 2 to 1 ratio and a 4 to 1 ratio. A trap or screen to prevent flock from interfering with the suds box drain may be required for handling woolens, although little trouble has been experience with this factor in the work with the knitted worsted fabric.

The committee, however, feels that in its present condition the detergency comparator is a useful tool and recommends that the necessary steps be taken, by the general research committee, whereby arrangements can be made with the manufacturer of the machine, the Riggs and Lombard Company of Lowell, to make it available for purchase through the association by anyone desiring to do so.

* * * *

Dr. Olney: In regard to the subject of fireproofness and inflammability, this work has been carried on under the direction of one committee with a subcommittee but we have now divided this work into two definite committees and the first committee is fireproofness of which James R. Redmond is chairman and we would like to hear from him now.

Fire Resistance

Mr. Redmond: Mr. Chairman, ladies, and gentlemen, the terrible hotel fire in Atlanta has been added to the list of tragedies which already heavily burdens the conscience of this nation as a thing which could have been prevented. You are well aware of the public opinion that has been increasingly aroused under the impact of disasters such as the Morro Castle, The Normandie, the Cocoanut Grove, and the Ringling tent fire. As these catastrophies increase, more and more people will be held accountable.

The AATCC Committee on Testing Fire Resistant Materials recognizes the needlessness for loss of life and property by fire and in connection with textiles we are accumulating and studying test methods for a wide variety of fabrics which are claimed to be treated to resist fire. We are receiving excellent cooperation from many technical groups and industrial facilities toward the development of a sound program for the definition and standardization of fire resistance.

The present AATCC test for fire resistant material has been the subject of six coordinated laboratory studies during the past year. We have not completed our investigation of the recognized variables, but the work is going forward and we can report considerable progress since the last annual meeting in New York.

Of course our extended studies may introduce modifications of our test method, so we must continue to consider the present test method as a tentative one. We are in contact with the California State Fire Marshall. He has told us of his desire to establish a practical method of testing flame resistant chemicals and fabrics treated with such chemicals. He has requested our assistance. We propose to gather the facts in the hands of our committee members and considered to be of value to him in his administration of a workable law. Our comments will be confined to actual test data and the interpretation of these data.

The Air Transport Association of America has requested our cooperation in connection with securing materials which have satisfactory flame resistant and fire resistant qualities. Allen Dallas, Director of Engineering, has advised us that the airlines operators are now engaged in a survey of the re-work of their present aircraft which will be required in order to comply with some recently adopted amendments to the civil air regulations under which all scheduled as well as non-scheduled areas operate. In these amendments the Civil Aeronautics Board has set up certain definitions concerning fire resistant and flame resistant materials and test procedures have been proposed.

At this time the materials used in present aircraft are being tested to determine which are satisfactory and which are not. The problem of replacing unsatisfactory materials falls into two divisions. The first of these is a determination of what materials are satisfactory in accordance with the test procedures set up by the CAA. The second division of this problem is to obtain sources of supply. Mr. Dallas has suggested that all manufacturers who produce materials which can satisfactorily pass the Civil Aeronautics Board tests should so advise the airline operators in order that the purchasing problem may be alleviated.

In addition to the two requests for assistance just described, our committee during the past year has received requests for information on our test method, requests for drawings of the equipment, requests for comments on tests being proposed by other technical groups, and requests for comment on publications. It is our intention to streamline and coordinate our work so that reasonable test methods will be available if and when national legislation is proposed. We have the cooperation of the ASTM committee under Dr. Walter Scott.

Dr. Olney: We will now hear from the other committee which is working along a similar line; namely, the committee on flammability, of which Dr. Hager is chairman.

Flammability

Dr. Hager: Mr. Chairman, ladies and gentlemen, we are a very young committee. We were only born about a year and three quarters ago. After a year of very intensive work we submitted to the research committee last March a machine and testing method which was then accepted as a tentative standard. Our work continued and we conducted scores of additional experiments in six laboratories on the strength of which we amended these methods with a combined dry cleaning and wash test which was designed to remove water and solvent soluble flameproofing finishes which might create a false sense of security.

The standards division of the National Bureau of Standards accepted our methods for a provisional commercial standard. This was sent out for comment to about one hundred interested parties and many valuable answers were received and incor-

porated in this proposed commercial standard. Like our own method it concerns itself only with fabrics as worn by persons. We are not dealing with flammable draperies, bed spreads, or any other fabrics. The commercial standard also requires that goods which are flammable according to the test results should be so labeled at point of retail.

The State of California was the first one to cover fabric's flammability by law. The first bill of January, 1945, was unenforceable but an amendment a few months later left the decision as to what are flammable fabrics to the discretion of the Fire Marshall and he and his assistants have gone thoroughly into the study of this field. They have extensively corresponded with our committee. The Marshall himself visited us last June and adopted, to a great extent, our machine and our methods. However, he had wanted to extend the scope beyond wearing apparel and in that way would have banned from retail stores innumerable fabrics such as marquisettes, bed spread materials, blankets, draperies, and so on. When the Fire Marshall called a Fire Advisory Board meeting for November 5 and 6, in order to have his regulations accepted, he was persuaded by us to call for November 1 a Pre-Advisory Board meeting with the industry and the retailers of California in Los Angeles which three of our members, Mr. Dorn, Dr. Bonnet, and I attended.

We were successful in convincing the Marshall that he should leave out of his regulations anything but flammable fabrics intended for wearing apparel. In other words, California has practically accepted our AATCC method and these regulations will go into effect in California on January 6, 1947.

Of course, the labeling required by the commercial standard and the complete banning of flammable fabrics which do not pass requirements in California will mean that all such goods will eventually disappear from the market all over the United States. It does not mean, however, that such goods cannot be produced, as they can be made flame resistant today according to two processes marketed by reputable companies which can do a good job on most fabrics. Another company's excellent process is on the way and will soon be ready for use. You will find in Parlor A a small exhibit of our machine and some flame resistant textiles.

What was accomplished in California we have felt all along should be done by a Federal law before other states with conflicting separate laws disturb the whole problem. Some of our committee members have, therefore, acted as technical advisors to lawyers and Congressmen in setting up a proposed Federal Bill which will on the 17th and 18th of this month be discussed with leading textile and retail interests of the country and which will then after sufficient polishing be turned over to a member of Congress to sponsor it for a Federal law.

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Dr. Olney: Next we will have the report of the committee on atmospheric fading of dyed material. Herbert Scull is the chairman of the committee, but A. J. Kellner is going to report for him.

Atmospheric Fading

Mr. Kellner: Mr. Chairman, ladies, and gentlemen; you will recall at our last meeting there were two matters which were of immediate concern in our atmospheric fading work. The one was what constitutes an appreciable change, and the other, the development of a suitable apparatus for recording or reading the appreciable change. It was decided that the first matter could possibly best be determined by distributing a group of fabrics, which Mr. Scull had correlated, to various groups, such as the dyers, testing laboratories, and the retailers group. This was done and a few weeks ago a meeting was held in the offices of the American Viscose Corporation, New York, N. Y., with the following present: C. W. Dorn, D. P. Knowland, Walter Stump, A. J. Heinzmann, W. H. Masterson, Frank Stutz, Dr. N. E. Hager, Dr. W. E. Coughlin, Herbert Scull, and A. J. Kellner.

This meeting was called to attempt to get a consensus of opinion as to what the retail group thought constituted an appreciable fading on samples of fabrics which had been exposed to the action of atmospheric gases.

Mr. Scull reported that he had distributed the group of fabrics to a majority of dyers and testing laboratories and was now anxious to get the opinion of the retail group since there were representatives of this latter group at the meeting. It was decided to have these members, as well as the others attending the meeting, examine the group of fabrics and grade them in an effort to determine which color changes would be considered acceptable and which would not. This then completed the study on the examination of the fabrics and Mr. Scull reported that there was not too much variation between the various groups. He felt that the committee now had a good conception as to the amount of color change which would be permissible and it is now planned to submit these samples to the color transference committee for their study in developing a suitable instrument for registering this change.

He also reported that a permanent record of these samples is going to be made by Charles Seibert of the DuPont Company by means of a spectrophotometer. It is felt that this record will be of valuable assistance to other committees who are interested in color work.

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Dr. Olney: We have next the committee on color transference and Daniel P. Knowland is chairman of that.

Color Transference

Mr. Knowland: At the Victory Convention held in New York last January our committee report reviewed in detail its work undertaken and completed during 1945, resulting in the adoption by the association of the AATCC chart for measuring transference of color. This chart has been on sale by the association during the past year, and we are informed that it has been favorably received by industry, both here and abroad, for use in evaluating color transference and migration. The use of the chart has been incorporated in the AATCC standard method for crock fastness. We believe that it will also be found useful in rating other standard fastness tests involving the staining of undyed fibers, and we repeat our previously expressed offer of cooperation with other standing committees in its application to their testing procedures.

At the January meeting we exhibited a double crockmeter designed by T. J. Scanlan of the Calco Chemical Division, American Cyanamid Company. Although approved in principle, several defects in design were noted, preventing our giving complete approval at that time. At the committee's suggestion, these faults have been eliminated, and after extensive practical trials the committee recommends that the new double crockmeter be approved by the association, as an addition to, though not replacing the current standard single machine. The double machine offers the following advantages to the user as compared with the single machine, with no loss in accuracy and reproducibility: (a) Greater speed in testing large numbers of samples, (b) Direct comparison of standard and sample, (c) Simultaneous dry and wet tests, (d) Concurrent testing of thin and thick fabrics.

In July, 1946, the committee was requested by Mr. Scull of the gas fading committee to meet with an advisory committee composed of industry representatives to discuss possible methods of establishing acceptable tolerances for rating the

acceptability of dyed acetate material subjected to a gas fading test. The committee on color transference has accepted the task of investigating the possibility of developing an instrument suitable for this purpose, but points out that this promises to be a difficult undertaking, rather far afield from the original scope of our work. We have added to our number several members who can assist us in this work, and have held several informal meetings to discuss this subject.

C. W. Monego has constructed a model of a binocular instrument employing a range of colored filters, which showed considerable promise, but which requires further experimentation and modification before it can be adopted. At a meeting in Washington a few weeks ago, Mr. Monego, Miss Dorothy Nickerson, Dr. J. B. Judd, W. D. Appel, and your chairman reviewed previous work, and Dr. Judd proposed a simple arrangement of clear and colored glass combined in a quadrant to be placed over original and exposed materials in such a way as to permit judgment as to whether the alteration in the exposed material exceeds the tolerance as set up by the filter chosen. This method also appears promising, but requires considerable study and experiment on faded materials. It is our hope that during the coming year we may be able to develop a simple, relatively inexpensive instrument which will answer all requirements.

The committee welcomes suggestions from any source with reference to this problem. The filter referred to above is expected to be on hand during this meeting and will be available for trial and comment by anyone interested.

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Dr. Olney: I think we shall go into this with quite a little study.

We have several short reports that we will listen to and one is in regard to work on plastics by Mr. Dorn.

Plastics

Mr. Dorn: I am going to make this rather brief, Mr. Chairman. There is really not much that we can report at the present time.

Some time ago the Society of Plastic Industries approached the American Association of Textile Chemists and Colorists and other textile organizations to aid them in setting up test methods for unsupported plastic films and sheetings and also coated fabrics. The various associations approached were the American Association of Textile Chemists and Colorists, the American Society for Testing Materials, the Rubber Manufacturers Association, and the Association of Pulp and Paper Industries.

The SPI group, that is the Society for Plastic Industries, has broken down the desired qualifications, that they wished to test, into a series of group qualifications and has assigned these jobs to various technical organizations. I'd like to go through these various groups and tell you how they have been assigned.

Under Group 1 we have low temperature flexibility and cold crack and that has been assigned to the American Society for Testing Materials. Pliability has been assigned to SPI to correlate and they have been instructed to work with the Quartermaster Corps and the Bureau of Standards.

Crease resistance is also in the picture, but has not yet been assigned. Resistance to breaks, tear, tensile strength, hardness, etc., has been assigned to the American Society for Testing Materials, Rubber Manufacturers Association, the paper group, the Quartermaster Corps, and the Chemical Warfare Division. Light fastness has been assigned to the American Association of Textile Chemists and Colorists and also ASTM. Resistance to weather has been assigned to AATCC and ASTM. Plasticizers is an SPI problem and also referred to ASTM, Division D-20. Color transference, bleeding, and color migration has been assigned to AATCC; cleaning methods to AATCC. Stain resistance to foods, drugs, cosmetics, and so forth, is an SPI problem Resistance to mildew has been assigned to AATCC and ASTM; toxicity referred to the National Institute of Health; resistance to perspiration assigned o AATCC.

Then we come into a group of physical characteristics such as blocking, adhesion, surface slip, adhesion of printing inks, and so forth, and they go to various technical associations which are fitted for that particular work. Inflammability and ignition has been assigned to the American Association of Textile Chemists and Colorists with the assistance of SPI and ASTM. Electrical properties, of course, are entirely out of our field.

With this set-up I would like to ask the executive committee on research to contact the various sub-committees which will be involved in this work and instruct them to work with the Society of the Plastic Industry in getting this work under way.

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Dr. Olney: The committee on standard methods of analysis will be reported on by Professor P. Theel.

Methods of Analysis

Professor Theel: Dr. Olney, the committee on the standard methods of analysis primarily has the problem of the revision of this booklet which you received.

We have divided the new book into twelve sections as follows: Section 1. General instructions and apparatus. Section 2. Standard solutions. 3. Reagents. 4. Methods of sampling. 5. Methods of analyses of general interest to the textile industry. 6. Determination of finishing materials—this to be done in cooperation with the committee or finishing materials under Mr. Gurley. 7. Determination of resins and resin finishes in cooperation with the committee under Dr. Lynn. 8. Identification and determination of dyestuffs on fiber. 9. Identification and determination of spots on fibers. 10. Identification and determination of textile fibers. II. Useful tables. 12. Index.

This will be considerably larger than the present booklet and probably will mean the finally completed book will be comewhere in the neighborhood of three hundred pages.

Now as to progress we have obtained to date, the section on general instructions is complete and ready for final editing. The section on standard solutions has been completed and is ready for final editing. The section on reagents has been completed. Fourth, methods of sampling have been completed with the exception of some additions to be made to the sampling of powders and solids. Fifth, the methods of analysis which are now under revision, about 75% of the ninety methods published in the last book have been assigned and reports made of them and in process of final editing. The section on determination of finishing materials,—we are looking for cooperation from Mr. Gurley's committee and we hope that that will come along in time before the end of the year. The same is true of the section on resin finishes.

I might go back for a moment and mention that under the standard analysis we have included a new factor; that is, under each chemical that is being analyzed is a short description of its most pertinent properties.

Eighth, the determination of dyestuffs on fibers, a broad outline of that has been prepared as a tentative proposal and will be published in the DYESTUFF REPORTER for criticism of the membership at large.

Determination of spots on textiles has been assigned and we have got an outline prepared and we are looking for the criticism and advice of many of our members.

The determination and identification of textile fibers, we are looking for the cooperation of that committee and I have

asked Dr. Olney to reactivate that committee so that we may publish something of their work in our booklet.

The section as to tables is being prepared and we are open to any suggestion as to what type of useful tables you might think should be included.

For the index, of course, there is no work done as yet because the thing hasn't proceeded far enough to really start.

We also asked that a section in the DYESTUFF REPORTER be set aside for publication of methods which we feel are tentative which may be added to this booklet, and in that connection the determination of dyestuffs on textile fibers has been sent to the DYESTUFF REPORTER and I hope will appear in an early issue.

Also a message on three concepts of certain reactive agents has been completed and sent in; a new method for analysis of formic acid and a new method of analysis for lactic acid.

As to present development, work is going on in the committee, a questionnaire has been sent out to quite a number on the determination of spots on fibers, and work is in progress in that connection.

A determination of enzyme activity,—work is going forward in that activity and Mr. Etchells is heading that group.

As to the determination of oil, soap, and residual fats, a questionnaire was sent out.

In addition we have considered the revision of No. 88, analysis of water, and we are working in connection with that in Philadelphia.

The section on coal we felt should be changed to fuels and we will welcome any advice or suggestions that you may have in this connection.

The section on soaps is being headed by Mr. Vanzile and he is getting together for us what seems to be some considerable improvement in the methods and analysis in that section as previously published.

That, I think, brings us up to date as to what this committee is attempting to accomplish. We hope to be able to have this ready for publication for the next Yearbook.

* * * *

Dr. Olney: I think you will all agree that we can look forward to a very valuable addition to our yearbook along this line.

I think Dr. H. D. Barker has a brief report to make in regard to his committee.

Mildew

Dr. Barker: Mr. Chairman, at the March meeting you will recall we submitted our recommendations for a proposed procedure for test methods, and that report has been accepted by the committee and will appear in the 1946 yearbook. We have had no formal meeting since that time, although Thursday a few of us got together to exchange ideas to see what seemed to be the post-war industry needs in mildew testing and the consensus of opinion was that while the interest had greatly diminished, there was evidence of a continuing need, and requests are coming in for work on outdoor fabrics such as awnings, fish nets, and various types of fabrics that are used outdoors for farm equipment. So that while it is anticipated that we will not have the need for the intensive work that was performed during the war, there will perhaps be a need for occasional meetings to consider changes that will come up in various problems and in light of the proposed test methods.

Dr. Olney: If there are no other reports or business to come before the research committee, I will declare the meeting closed.

Colorfastness of Textiles to Pleating

Tentative Test Method

Scope

This method of testing covers the testing procedure for determining the fastness to pleating of dyed textile fabrics.

Specimens

All specimens shall measure at least 2" x 4". In addition to the test samples, a control sample is necessary which is prepared as follows:

A closely woven cotton cloth is dyed with 2% Pyrazol Fast Violet 4BL(1). The dyeing is carried out for one hour in a volume of one to forty using 20% Glaubers Salt in the dye bath. After dyeing, the sample is rinsed in cold water and allowed to dry in the air. NOTE: All percentages are based on the weight of the fabric.

Apparatus

Any apparatus may be used which will withstand 5 lbs. steam pressure. A sufficient volume of steam should be available to permit the pressure to rise to 5 lbs. pressure within five minutes. Pressure cookers, and the ordinary laboratory pressure autoclaves have been used successfully for this test.

Procedure

The specimens are pleated (approx. ½" pleats) between two sheets of standard filter paper, tied with thread, and steamed for fifteen minutes in a strong current of steam. The exhaust value of the steam box is so adjusted that the pressure of five pounds is maintained during the whole procedure. The control sample must show a definite change in color to a bluer violet.

Reporting

1. Shade changes and returns very slowly or not at all.
2. Shade changes but returns within one hour.
3. No change in shade or strength.

Explanatory Notes

(1) One (1) ounce sample of Pyrazol Fast Violet 4BL may be obtained for $1.00 from the Secretary of the A.A.T.C.C., Lowell Textile Institute, Lowell, Mass.

Resistance of Colored Textiles to Phototropism

Tentative Test Method

Scope

This method of testing covers the testing procedure to determine the reversible change in shade of dyed fabrics exposed to a source of light for a short period.

Procedure

A dyed sample that has been kept in the dark for a least two hours is partly exposed for ten minutes to direct sunlight or for ten minutes in a Fadeometer. The covering is then lifted and if a change in shade is observed, the specimen is placed in a subdued light and examined again after one hour.

Dyestuff samples are dyed by themselves and also in combination with a non-phototropic dyestuff and the dyeings exposed as above.

Classification

If a change of shade is observed after the original exposure and is not evident an hour later, that dye is to be classified as being phototropic. No standards or controls are necessary.

Nylon Staple Fiber*

DR. L. L. LARSON

Manager Sales Development, Nylon Division, E. I. du Pont de Nemours & Co.

I. Introduction

THE introduction of high polymer fibers to the field of textiles calls for the development of new arts and knowledge in the production and the finishing and dyeing of fabrics. Nylon is a high polymer fiber that seems destined to assume an important position in the textile industry in both the continuous filament and staple forms. The use of this fiber will be accompanied by an increasing need for new procedures in fabric finishing to develop optimum aesthetic properties and serviceability.

The finishing procedures required for nylon fabrics are by no means conventional. The old adage that finishing either makes or breaks a fabric is particularly true in the case of nylon. Although knowledge of finishing nylon fabrics is still rather meager, the fundamental importance of proper technique is fully appreciated.

The finishing industry has responded splendidly to this challenge of developing methods for processing nylon fabrics. It is expected that there wil be a steady forward movement in the "knowhow" and development of economical and efficient equipment and procedures for the finishing of these fabrics. The Du Pont Company is grateful for the cooperation and the progressive attitude of the finishing industry.

It can be anticipated that nylon staple fiber will exert a fundamental influence on the textile industry because it is so outstandingly different in its properties from the other staples. Furthermore, its particular properties which are so outstanding are ones which contribute to fabrics, properties of economic value. As more knowledge is gathered regarding the use of nylon staple in fabrics, the evidence points more and more to the ability of this fiber to contribute to selected types of fabrics qualities which will have real consumer appeal.

II. General Description of Nylon Staple Fiber

Nylon staple is now being produced only on an experimental unit located in Wilmington, Delaware. Early in 1947 limited commercial production is expected. Currently, deniers per filament of 1.5, 3, 6, 10, and 15 in cuts of 1 to 5 inches are being produced. At a future date the exploration of deniers finer than 1.5 denier per filament is expected.

Fortunately, one of the fundamental mechanical properties of nylon is its ability to take a crimp. It is perhaps the easiest to crimp of any of the fibers. Crimp gives to the staple the mass cohesion that is so essential to good processing properties. A crimped staple is fundamental for good spinning in the wool, worsted, and the cotton systems. High crimp develops loft in spun nylons, a property of especial importance in such items as sweaters, half hose, flannels, blankets, etc.

Another important element of nylon staple is an anti-static finish. This finish should give not only anti-static properties but also the proper lubricity to the fibers for drafting purposes.

The necessity of a uniformly cut staple is well known. At the present time, the 1.5 denier staple is cut uniformly enough to spin commercially counts as fine as 40s on the cotton system. The 3, 6, 10, and 15 denier staples are cut uniformly enough for all spinning systems. Real progress has already been made in cutting nylon staple. With continued process improvements and experience, it should be entirely possible to develop a staple that will spin successfully to very fine cotton counts. For example, 1.5 denier nylon has already been spun experimentally to 100-s and a well cut 1.0 denier nylon staple will probably spin to a much finer count.

III. Processing Properties of Nylon Staple Fiber

Nylon staple has been processed successfully in initial trials on each of the spinning systems. On the woolen system it has been found that 10 denier per filament processes exceptionally well and gives a very full yarn. This is illustrated by rug yarns which have been spun. The fullness of the nylon yarn is very apparent. The running properties of this staple on the woolen system are excellent. Three denier nylon spun on the woolen system has also given a good performance by itself and in a blend with wool on the Bradford system. Six denier nylon staple as 2/15 Bradford worsted your has been made up into sweaters with success. On the French worsted system, it may be processed either by itself or in blends with wool.

Nylon staple fiber is performing well on the long draft cotton system. This is also true for 3 denier staple on the conventional cotton system. Thus, nylon staple is adaptable to each spinning system either for spinning by itself or in blends with other fibers. The yarn referred to above has been produced during the first experimentations on thse various systems. In each case the results were either acceptable, good or excellent. One can anticipate with continued research and development marked improvements in strength, uniformity, and loft.

IV. Properties of Nylon Staple Fiber

The three most outstanding properties of nylon staple now appear to be its strength, abrasion resistance, and dimensional stability in washing.

Compare nylon with some of the other fibers in these three properties. In the accompanying chart, nylon has been given a rating of *10* and other fibers—cotton, viscose, acetate, and wool—have been rated accordingly. These ratings are not to be taken as strictly accurate, but they are in an approximate range of accuracy. It is seen that nylon is five times as strong as wool, that it has three times the abrasion resistance of wool, and that it is stable in washing. It is true that more and more is being done by chlorination and by resin treatments in stabilizing wool against shrinkage during washing. However, it is an untreated wool that is dealt with in the chart.

There are other properties in which nylon excels. The importance of elastic recovery which keeps hosiery and other garments from becoming baggy is well known. Quick drying is a desirable property contributed to the textile world by nylon. Combined with these properties are ease of washing and ironing, and very high wet strength which minimizes tearing of garments when wet. In certain textiles, particularly those for the tropics, the mildew, fungus, and moth

*Presented at meeting, New York Section, November 22, 1946.

resistance of nylon should be of particular importance. Also, in industrial fabrics, its oil and alkali resistance, high fatigue resistance, high impact strength are all important as well as the significance of strength and abrasion resistance.

The non-allergic properties of nylon are, of course, of fundamental importance to a textile fiber.

Fabrics made from spun nylon are characterized by softness to the touch and with the finer deniers they have good fullness and texture. The difference between the four deniers has been illustrated by anklets which have been knitted from 1.5, 3, 6, and 10 denier nylon staple spun yarns. The 1.5 denier anklet has a very cashmere-like hand. However, it is very limp due to the low bending modulus. The 3 denier anklet is still very pleasant to the touch, but is firmer. This yarn still gives very good fullness and texture. A much crisper but more sleazy anklet is obtained with 6 denier and these properties are even more pronounced with 10 denier.

V. Blending Properties

The engineering of particular properties in yarns and fabrics by the blending of fibers is a science which is gaining real stature in the textile industry. The advantages to be gained from blending will become even more apparent with the use of nylon staple because of its outstanding characteristics in comparison with other staple fibers.

Wool-Nylon: Wool and nylon seems assured as a prominent blend of tomorrow because these fibers are such natural complements of each other. Wool is a resilient fiber that can be made into a fabric which resists wrinkling. Also, it gives the fullest yarns of any of the staple fibers. The importance of these two properties in clothing is well known. On the other hand, nylon contributes the strength, the abrasion resistance, the washing characteristics, and the dimensional stability that are so important in many fabrics. The increase in strength contributed by nylon is directly proportional to the amount of nylon used in a wool blend, and for each one per cent of 3 denier nylon in the blend, there is approximately a four per cent increase in strength of the yarn.

Likewise, nylon staple will be used to improve the strength of viscose, acetate, and azlon spun yarns.

Nylon-Viscose: This blend gives to fabrics a pleasing hand. Nylon will contribute strength, abrasion resistance, and dimensional stability in washing and in wearing, so the blend should grow in importance. An interesting possibility is the use of a blend of nylon and viscose for spinning fine count, strong yarns which will give lightweight, washable fabrics. Any work along this line must await the development of a uniformly cut, fine denier nylon staple which runs well on the cotton system. The nylon-viscose blend should be explored in the woolen system to produce lofty yarns for warm, washable and durable fabrics.

Nylon-Cotton: In the case of blends with cotton, nylon can contribute not only strength, abrasion resistance, and dimensional stability, but also it can impart better elastic recovery, quicker drying, higher fatigue and impact resistance, better resistance to degradation by perspiration, and a softer and fuller hand. A possibility of real potential is the use of a fine denier nylon with a domestic cotton to compete with the finer grades of imported cottons for spinning to fine counts and for use in sewing threads.

Nylon-Acetate: Although little work has been done on this blend, it would appear to be another natural. Acetate would contribute its qualities of excellent hand and appearance, while nylon would add strength and wearing qualities. The fabrics would be dimensionally stable. This blend should be explored in woolen and worsted type fabrics as well as in cotton type fabrics.

CONTRIBUTIONS TO END PRODUCTS

Property	Rating of Fibers as Spun Yarns				
	Nylon	*Cotton*	*Viscose (Regular)*	*Acetate (Regular)*	*Wool*
Strength	10	6	3	2	2
Abrasion Resistance	10	4	3—	2	3+
Dimensional Stability in Washing	10	6	3	8	1—

OTHER INTERESTING PROPERTIES

Elastic Recovery
Thermosetting
High Wet Strength
Crush Resistant
High Perspiration, Oil & Alkali Resistance
High Mildew, Fungus & Moth Resistance
High Fatigue Resistance
High Impact Strength
Non-allergic
Softness to Touch
Fullness & Texture in Fabric Form

VI. Utilization of Properties of Nylon

An analysis of the properties of nylon staple in comparison with other fibers leads to the conclusion that the use of nylon staple should provide the following to the textile world:

1. More durable fabrics.
2. Completely washable and durable, yet warm and light fabrics.
3. Lighter fabrics of equal or better wearing qualities and strength.
4. Completely washable fabrics that are more muss resistant than cotton fabrics.
5. Cooler fabrics.
6. Dimensionally stable fabrics.
7. Moth, fungus, and mildew resistant fabrics.
8. Alkali resistant fabrics.

A review of a few of the specific end uses where nylon appears to make real contributions follows:

Hosiery: Nylon staple promises a new era in spun hose. Through its use, warm, comfortable, completely washable, and very durable men's half hose, anklets, and athletic socks will be made. Darning chores will almost vanish. Another important feature of spun nylon or blends with wool containing 65 per cent or more of nylon is freedom from shrinkage, thus making it unnecessary to dry the hose on stretchers. Through the choice of the proper blend of nylon filament diameters, the proper size of spun nylon yarn, and the proper spinning system, spun nylon hose of all types ranging from the finest lisle type through the medium weight wool type to the heaviest wool type will be prepared. In addition, new types of hose will be created. First of all, a very lightweight, soft anklet which is comfortable for summer year, yet durable, may be a reality. Men's winter and summer weight hose of cashmere softness will result from fine denier spun nylons. Sheer full-fashioned spun hose will be created. Spun nylon will also permit the manufacture of hosiery that will not scratch or irritate the skin. Furthermore, nylon hosiery may be boiled at each washing to kill fungi if required.

Sweaters: Spun nylons promise to be nearly as important in sweaters as in hosiery. Here they will provide not only washable sweaters, but sweaters which get lovelier with continued washing, and

without the need of blocking. Furthermore, light pastel shades may be worn without any worries about washing. Babies' sweaters of cashmere softness which can be boiled to sterilize will be a reality. By proper choice of the type of nylon staples, the gamut of types of sweaters from cashmere to coarse, heavy types will be made. Durability, washability, and warmth will be properties common to all.

Swim-Suits: The quick drying and low wet weight of nylon will contribute to greater comfort in swim suits.

Underwear: In addition to hosiery and sweaters, underwear will utilize these same properties of nylon. Imagine the softness of 1.5 denier spun nylon in an undershirt and then couple this with the washing and wearing properties of such a product.

The increase in strength of spun yarn containing nylon indicates an important trend towards lighter weight fabrics knit on finer gauge machinery.

Flannels: Quality flannels which do not have to be dry cleaned but may be laundered at home, which are durable, and which have excellent hand will be prepared from nylon and from blends of nylon with other fibers such as wool, viscose, and cotton. It is anticipated that the ease of washing and ironing spun nylon dress flannels will encourage their production in a wide range of delicate pastel shades, which in the past have proved rather impractical. Either nylon or blends with wool up to 35 per cent of wool should find real application in warm, washable winter shirts and robes of excellent wearing properties. The loft of woolen spun nylon yarn indicates real promise in shirtings.

Upholstery: Nylon staple fiber has practically all of the properties that are needed in a good upholstery. Here, one wants durability, easy cleaning characteristics, good sliding characteristics, and excellent appearance. All of these nylon can contribute and it should find wide application in this field.

Rugs: As in upholstery, nylon has valuable properties as a rug fiber. Abrasion resistance and crush resistance as a pile are two of its features. In addition, woolen spun nylon yarns have very excellent covering power in rug piles.

Industrial Fabrics: There are many applications in industrial fabrics which are seeking the durability, strength, fatigue resistance, and other properties of nylon. Some of the more notable examples are: paper makers felts, press cloths, V-belt coverings, diaphragms, filter cloths, bags (particularly mail bags) and canvas gloves. Fabrics of greater strength and abrasive resistant properties or conversely lighter weight fabrics of equal strength and durability may be engineered. In industrial fabrics, nylon will find application alone and as blends with other fibers, especially cotton, wool, and viscose.

Threads (Sewing and Darning): The strength and durability of spun nylon threads should make them of promise in this field.

Sheets: Nylon presents the possibility of producing very lightweight and cool, yet durable sheets which when washed will dry quickly.

Work Clothes and Uniforms: Nylon should be able to make significant contributions in the field of work clothes and work uniforms. It has practically all the properties that are needed in a good work clothing. These are durability, strength, tear resistance, perspiration resistance, quick drying, and freedom from shrinkage in washing. Here a blend of nylon and cotton or of nylon and viscose should find wide application.

Summer Clothing: The high strength of nylon will make possible the production of lighter weight wool type and cotton type fabrics which are strong and durable. This will mean cooler clothing for summer wear. Also, it will mean improved washing characteristics of summer fabrics. An attractive summer suiting material of merit, satisfactory for both men's and women's wear, which could be laundered at home in a manner similar to a shirt, is promised through the use of nylon.

Overcoatings: A small percentage, say up to 20 per cent, of nylon in overcoatings might greatly improve their wearing properties. The presence of nylon should retard localized wear at the cuffs, the lapel, etc. Small amounts of nylon should also contribute significantly to the wear of suitings.

The above examples are a few places where nylon may make a real contribution to the textile industry. In some of these applications nylon has already proven itself. In others, there are intensive explorations in progress at this time.

VII. Finishing and Dyeing

Finishing Spun Nylon Fabrics: A finishing operation develops consumer appeal and dimensional stability in fabrics. Often these qualities are in the fabric in a "latent" state and it is necessary to "awaken" them by finishing. This is particularly true in the case of nylon fabrics.

Considerable progress has been made by the textile industry in finishing procedures for nylon fabrics woven from continuous filament yarns. In general, these same procedures are applicable for spun nylon fabrics and for spun fabrics containing a significant percentage of nylon staple.

Thermosetting is the most important step in the finishing of a spun nylon fabric. This thermosetting is accomplished by subjecting the fabrics to either dry heat or saturated steam pressure for a short period of time. These treatments exert a fundamental influence on the character of the fabric. In the first place, the treatment develops a desirable softness of hand, better draping properties and more life and character in the fabric. Secondly, properly set nylon fabric has much greater ability to recover from wrinkling. Thirdly, the thermosetting treatment develops dimensional stability in the fabric which precludes trouble due to shrinkage in washing or changes in shape during wearing. Finally, the thermosetting treatment imparts to the fabric ability to resist excessive wrinkling in washing with the result that ironing is simplified. The few wrinkles in the fabric are readily removed by ironing without sprinkling the fabrics.

To illustrate the effect of thermosetting treatments, four samples of spun nylon fabric were taken from the same piece of greige goods and subjected to the following procedures. One of the pieces was given only a conventional scouring and dyeing treatment followed by a mild semi-decating operation. Another was subjected to 25-pounds positive steam pressure for thirty minutes, dyed and semi-decated. Another was hot air treated at 450° F. for 67 seconds, followed by dyeing and semi-decating. The fourth was dyed and then subjected to a urea-formaldehyde resin treatment using a 350° F. curing temperature. An examination of the four samples demonstrates conclusively the significance of the thermosetting treatments. The sample which was given only a mild semi-decating (not enough to thermoset the fiber) lacks draping properties, life, and has poor ability to recover from wrinkling. All of the other treatments improve the hand, the drape, and ability to recover from wrinkling. Also, the set samples are completely stable to washing. In addition, wearing tests would probably demonstrate that these thermosetting treatmens increase the ability of the fabric to retain its initial shape in garment form.

Similar results are obtained in the thermosetting of nylon sweaters. The important properties developed here are an even better hand and dimensional stability in wearing and washing. The best finishing procedure for sweaters now appears to be treatment with saturated steam pressure followed by washing in soapy

water at near the boil. A similar process should be used in finishing spun nylon half hose, and similar benefits are obtained.

It is apparent, therefore, that a proper thermosetting treatment of spun nylon fabric is beneficial and imperative. The setting conditions most suitable for different fabrics vary. Each manufacturer will find it necessary to develop the optimum thermosetting procedures for his own specific requirements. The Du Pont Company will be glad to work with the textile industry in developing the proper treatments for specific end products.

Dyeing: Regarding the dyeing of spun nylon fabrics, the best counsel is to seek the assistance of the dyestuffs industry on any problems. So far, all problems that have arisen in the dyeing of these fabrics have been solved acceptably well. It is believed that real strides are being made now by the industry and that the art will be advanced greatly during the next couple of years.

Acetate dyes have been used extensively in the dyeing of continuous filament nylon fabrics because of their good leveling properties. In the case of spun fabrics, however, this need for acetate colors no longer exists. It has been found that acid colors will give level dyeing on spun nylons. So the good wet and light fastness of this class of dyestuffs may be utilized. Consequently, the dyeing of spun nylons is simplified, especially in the case of 100 per cent spun nylon fabrics, and fabrics made from blends of nylon and wool.

In blends with viscose, cotton, or acetate, various combinations of dyestuffs may be employed to obtain the required results. Here however, the art is not as well advanced as in the case of dyeing blends of nylon and wool. It is recognized that the dyestuffs industry realizes the importance of furthering their knowledge of the dyeing of these blends. Also, it is realized that the finishing industry will continue to follow closely the advances made by the dyestuffs industry in the dyeing of blends of nylon with other fibers.

VIII. Conclusion

In conclusion, many of the properties of nylon staple are so outstanding that it offers real possibilities to the textile industry. Researches on construction of fabrics and fiber compositions should give more durable fabrics, more adaptable fabrics, more dependable fabrics, and more satisfying fabrics. Furthermore, when cost is dealt with in terms of months or years of satisfactory wear in the particular application under consideration, one will obtain lower cost fabrics through the use of nylon.

All concerned are naturally very interested in seeing nylon staple fabrics explored by the finishing industry. In the development of finishing procedures one of the vital requirements will be a thermosetting treatment. The Du Pont Company is ready to cooperate with the finishing industry in any practical way in explorations of this product.

—♦ ♦—

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Progress in Textile Technology

*How Can We Make It Effective Now?**

WALDEMAR R. KUENZEL
Executive Manager, Fabric Development Dept., Deering, Milliken & Co.

ALL of us recognize that the textile industry, stimulated by war conditions, has been and still is going through a vast and progressive stage of research and development on textile fibers and textile finishes to a degree unknown in our industry before. Many new synthetic products such as nylon, Fortisan, Vinyon, Saran, and protein base fibers have been launched during the past five years while others, with research work well under way or near completion, have not been marketed as yet for technical, economic, or other reasons. There is no doubt that these new developments mark important advances in fiber technology. As some of them are made to fill specific textile needs, they have a profound influence on textile fabrication.

The question therefore arises, "What effect does the influx of these fibers have on textiles?" In the first place, it has brought about a strong tendency toward analyzing the functional characteristics of fabrics in order that they may meet the more exacting demands of the consumer, and, secondly, there exists today, a much broader attitude on the part of the textile manufacturer toward the selection of his raw materials.

Speaking of fabrics, experience has shown that in a competitive market the element of style is always in the foreground, and there is every reason to believe that the impetus to new business will again come along these lines. I am convinced, however, that in the future the consumer will not choose on the basis of fabric appearance but also pay increased attention to the serviceability for its purpose. In other words, serviceability is becoming a fabric requirement nearly equal in significance to style.

How, then, are the consumer's expectations being met? I stated before that many of these new fibers have been and will be made to fill specific textile needs. This greatly increased number of new and improved synthetic products, in addition to all of the natural fibers, offers the textile manufacturer a greater choice than ever from which to select the fibers most adaptable to perform required functions in textiles. In other words, it is accomplished by the combined uses of various type fibers; that is, we are entering an era of yarn combinations and fiber mixtures.

Fiber Blends

Of course, there still are users or manufacturers of fibers—natural fibers in particular—who seem to feel that any blending of their particular fiber with another fiber is an adulteration of the end product. If this theory is correct, then each fiber is best for every purpose. Wool is best for all fabrics. Cotton can be made to serve the same purpose and the synthetic fibers can be made to equal or improve either. Just consider: if wool is worn and the body perspires, resulting in a disagreeable, sticky feeling, is it any reflection on the value of wool to blend some nylon with it in order to overcome this feeling? If damp cotton has a cold, clammy feeling, is it disparaging to cotton to blend other fibers with it to overcome this clammy hand? If rayon loses tensile strength when wet, does it belittle its value to combine it with cotton or blend it with linen or ramie, which fibers are stronger when wet than dry? In other words, is it not a disservice to any fiber to claim too much for it? Would it not be more logical to admit that each fiber has particular properties and is best suited to particular needs? Once this realization prevails, still better and more effective blends will be made. Though it may alter more or less the properties of the individual ingredients, it will produce the combined characteristics desired. It is evident that in this day of specialization a thorough knowledge of the physical and chemical properties of all textile fibers by chemist and technologist is needed to produce best possible results.

Speaking of yarn combinations or fiber blends brings forth many questions. Is the fabric to be for a handkerchief or a table cloth, a curtain or a shirt, a suiting, a lining, or an undergarment? For what purpose is the blend intended? How is the fabric to be used? Is it for quality or price? Is it for style or service. Is it for warmth or coolness? Must it be commercially launderable or dry cleanable? Must it withstand considerable abrasion or will there be none?

And here is the key to textile development. Textile manufacturers today must be concerned first with determining the fundamental properties of fabrics which will best serve certain uses and then choosing the proper yarns or fibers to achieve these ends.

And while it is the problem of the technologist to determine the proper fiber mixtures and fabric construction to produce textural interest and fabric performance, an equal responsibility rests with the dyer and finisher for the success of these fabrics. You know that special finishes such as resin treatments, water repellency, gas and mildew proofing, flame proofing, and the use of vat and fast pigment colors, are becoming increasingly important fabric attributes. You have solved some of these problems and I am confident that many more of these problems will be solved by your branch of the textile industry.

Consumer's Needs

I want to show you today a chart (Figure 1) which was prepared about four years ago for a group of rayon chemists engaged in the development of new and improved synthetic fibers. This chart was developed for them merely as an instrument in bringing consumers' needs right into their laboratory. It bears evidence of a development approach or a trend of thinking prevalent with chemists and technologists for many years.

You will note that we unumerate various textile uses and the most essential fabric requirements of each. When a consumer purchases any of these items, whether they be made of wool, silk, cotton, linen, rayon, or any other fiber or blend therefrom, he will look for the characteristics we have listed.

Of course market studies show that the consumer bases his fabric or garment selection on (1) color, (2) style, which is cut of garment, and (3) textural interest, all of which fall into the category of aesthetic appeal. Since it is generally acknowledged that these are the most important factors in wearing apparel, it was felt unnecessary to include them in

* Presented at meeting, New York Section, January 31, 1947.

AESTHETIC AND FUNCTIONAL REQUIREMENTS FOR FABRICS

FIELDS	HAND	RESILIENCY	DYEING IN DARK COLORS	UNIFORMITY IN DYEING	COLOR FASTNESS	FABRIC STRENGTH	CONTROLLED SHRINKAGE	RESISTANCE TO ABRASION	
								Dry	Wet
WOMEN'S WEAR									
Utility Dresses	●				●	●	●		
Sports Dresses	●	●	●		●				
Fashion Dresses	●	●	●	●					
Suits	●	●	●		●			●	
Washable Suits & Slacks	●				●	●	●		
Linings	●		●	●				●	
Woven Underwear	●			●		●			●
Knitted Underwear	●	●				●			●
MEN'S WEAR									
Suits		●	●		●			●	
Washable Suits & Slacks			●		●	●	●		
Linings	●		●	●	●			●	
Dress Shirts					●	●	●	●	
Sports Shirts	●				●	●	●		●
Woven Underwear	●				●	●	●	●	
Knitted Underwear	●				●	●		●	
MISCELLANEOUS									
Curtains					●	●	●		
Draperies				●	●		●		
Upholsteries: Pile Fab.	●	●	●		●			●	
" Tapestry				●	●	●		●	
Blankets: Cotton	●					●	●	●	
" Wool	●	*●					●	●	
Floor Coverings		●			●			●	
Sheetings						●	●	●	

DEFINITION OF TERMS

HAND
Response to the sense of touch, viz., degree of softness or harshness, thinness or fullness, smoothness or roughness; i.e., general consistency of fabric.

RESILIENCY
(A) Ability to resist compression, and if compressed, to recover original shape once the strain is removed.

* (B) Thermal conductivity translated into loft or bulk which is not lost in use due to lack of resiliency.

DYEING IN DARK COLORS
Clarity of color tone in relation to degree of luster desired.

UNIFORMITY IN DYEING
Even absorption of dyes; i.e., free from streaks or bands to maintain over-all density of color.

COLOR FASTNESS
Retention of color density after subjection to laundering, sunlight, perspiration, etc.

FABRIC STRENGTH
Ability to withstand frequent laundering.

CONTROLLED SHRINKAGE
Ability to retain original dimensions within a confined tolerance when subjected to repeated laundering.

RESISTANCE TO ABRASION
Ability to withstand normal rubbing action within a prescribed tolerance as measured by ultimate use.

W. R. KUENZEL

FIGURE I

this chart of requirements. Referring to hand of fabric, the consumer is evaluating consciously or unconsciously how the material will feel to the skin, how it is going to hang or drape, and possibly also estimating how it is going to wear, and whether it is firm or soft. It is true that we derive a definite pleasure from the softness of a velvet dress or from the stiffness of a pile in a carpet. With the exception of hand, therefore, which could also be classified under aesthetic appeal, this chart refers mostly to such primary functions as fabric strength, resiliency, color fastness, resistance to abrasion, dimensional stability and so on. To be sure, although these are hidden fabric values, they are extremely important fabric values to the consumer.

Take for instance the case of the house or wash dress. A rather comprehensive consumer survey conducted by the American Home Economics Association, among nearly 12,000 women, indicated that color fastness outranks all other characteristics in the order of importance, with shrinkage control in second place. However, there is one point that I would like to stress, namely, that a property which is rated as important in any one of these cases, when existing as an isolated characteristic is of little avail. Take for instance the case of suitings. The existence of resiliency is of little value without proper balance in resistance to abrasion and color fastness, or in the case of shirtings, dimensional stability alone is of little help without the proper balance in fabric strength, color fastness, and resistance to abrasive wear. Those of you who are interested in the development of resin and/or chemical treatments for producing fabric resiliency, dimensional stability, water repellency, mildew proofing, and flame proofing, recognize that in all cases, it is the combined effectiveness and proper balance of at least three or four such requisites that will determine the quality of material and performance in use. I believe an undue amount of attention has been given in the past to fiber and fabric tenacity, and I am glad to see that increasing attention is being directed toward evaluating resiliency, fabric stability, moisture absorption, heat transmission, and the like.

I am merely telling you these things to emphasize the extent to which chemist and technologist are concentrating on consumer needs. Your work and studies on gas fading, color fastness, the establishment of standards on water repellency, and your current investigation on flammability and dimensional stability give testimony to this effect.

Cooperation

There has been real progress in textile technology, but how can we make it effective now?

There must be much closer cooperation between mills, converters, manufacturers and retailers. We must go to the converter and above all to the retailer, who is closest to the consumer, and impress upon them the advances made in textiles. True, there are a few converters, a very few converters, who have a plan, who test and stand back of their merchandise. True, there are a few retailers thinking and operating along similar lines, but there are not enough of them. I admit we cannot expect the converter and the retailer to keep up at all times with the rapid tempo in textile development, but we can expect them to think along these lines. It is their analysis of fabric requirements and their demanding them that will insure best dollar value to the consumer. They must be able to answer these questions: how is the fabric or garment to be used? Must it be commercially launderable or can it be dry cleanable? What are the shrinkage requirements? What are the respective color fastness requirements to commercial laundering, home laundering, to sunlight, to perspiration? Just during the past few weeks through NRDGA meeting and articles printed in trade papers, we had the opportunity of getting the retailer's point of view on textiles and hear of their complaints. We have heard their complaints, but let us tell them, the retailer and the manufacturer that there, for instance, is no need for gas fading, no need for lack of color fastness, in many cases they can get what they want for the asking and their willingness to pay. The retailer must recognize that in the final analysis it is his responsibility, it is his decision of what to buy or what not to buy for today's more discriminating consumer.

Standards

Probably one of the reasons why the mechanical appliances for the home and automobile have shown such a tremendous increase in sales is because consumers derive much satisfaction out of the efficiency of operation of these modern devices. Look through a mail order catalog. Almost every nut and bolt, refrigerator, radio, and washing machine is made or bought according to manufacturers' standards or specifications, in many cases on the basis of the retailer's own standards and specifications. It would seem an easy matter for them to establish and abide by a few simple standards along such or similar lines (Chart). Progress on textile standards for the consumer has been much too slow; or are they waiting for someone else to do the job for them? Converters, manufacturers and retailers should and must have more and better standards on textiles or consumer pressure may eventually impose regulations upon the industry through the Federal Trade Commission, or through other channels.

Truthful Advertising

But that is not all. There must be truthfulness in advertising. The consumer resents misleading comments. What do I mean by that? Let me give you an example, a poor shirting: I wonder whether this fabric was tested, or are the means of testing textiles that unreliable?

Advertising in this great and changing field of textiles must be informative. I don't mean informative to the extent that a manufacturer or retailer should be able to guarantee a suit or a shirt to wear a certain length of time; of course not, simply because of the great differences in stresses and strain in wear and differences that occur in laundering, but I do believe that the retailer can tell the public in simple, clear-cut language about those characteristics which he may be able to assure or guarantee, in simple language, enabling the consumer to apply it to his own needs.

Let us recognize that textiles will soon be in competition with automobiles, radios, refrigerators, and other goods for a share of the consumer dollar. Our competitive position is likely to be seriously impaired if the advances made in the durable types of consumer goods are not matched by a considerable increase in consumer satisfaction that can be derived from textiles, based on today's progress in textile technology.

National Convention

Congress Hotel
Chicago, Ill.

October 23, 24 and 25

Under Auspices of
Mid-West Section

Functional Engineering in Textiles*

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Introduction

TEXTILES, next to agriculture, is the world's largest and oldest industry. Its beginnings are lost in the pages of time as is man's discovery and use of fire, domestication of animals and cultivation of plants. We know that early man sought to supply his basic wants of food, clothing, and shelter in devious ways. His earliest clothing most likely consisted of animal skins tied by thongs or fastened by briars. Early records indicate that ancient man tended sheep for the clothing they afforded as well as food; also that he raised flax from which he spun and wove a very fine linen. The use of silk is recorded also in ancient history and cotton has been cultivated, spun and woven for thousands of years. It is interesting to note that an examination of fragments of fabric dating back several hundred years B. C. reveals a close similarity between fiber and fabric structure of the ancient and our present day natural fibers and fabrics.

Trends in Textile Functional Engineering

For centuries man has employed the naturally occurring fibers; cotton, wool, flax and silk for fabric production. The cultivation, spinning and weaving of these fibers long remained an art based upon the experience and knowledge of the preceding generation. Even the large scale production of textiles in factories brought about during the industrial revolution was based upon skillful inventions applying previously known art.

Only in comparatively recent years has the study of the fundamental properties of the fibers enabled the textile industry to be placed on an engineering basis. Much more research needs to be done along the line of securing physical data based upon standard tests, but considerable useful data have been assembled by Appel (1), Smith (2) and others. There is an abundance of data available for the synthetics, but this is to be expected since they are the product of modern chemical research. However, the design and construction of fabrics from all fibers can and should be placed upon a functional engineering basis.

Functional engineering in textiles may be defined as the art of selecting and using the proper fiber or combination of fibers most appropriate to the use for which a given fabric is designed. It is characterized by an emphasis on composite construction in which each material serves best its own particular function in a way that lowers the net cost of the final product at no sacrifice in quality.

The recent war accelerated the use of functional engineering in textiles and many of the fabrics developed for special wartime uses will find peacetime application. One important line of fabrics was developed by the Shirley Institute in England for providing the commando with a light storm-proof uniform. The fabrics were given the name "Ventile" to signify that they allow air to pass through, though they resist water. It has long been known that cotton swells on the application of moisture, and the fabrics are spun and woven in such a way that this automatic swelling fills the interstices of the cloth and prevents the water from going through. Golf jackets, wind-jammers, and light-weight raincoats are among the likely peace-time outlets for these new fabrics. It is interesting to note that Goldthwaite and others at the Southern Regional Laboratory in New Orleans, using the same functional properties of cotton, developed a light weight cotton water-hose for fire-fighting purposes.

Through the use of functional engineering, the term textiles has now grown to include materials which are made from unspun and unwoven fibers such as Masslinn, Bonnlinn, etc. In other words, functional engineering has wed textile fibers with plastics in the new field of unwoven fabrics.

An unusually good example of functional engineering is afforded by a disposable diaper just recently developed by the Industrial Research Institute of the University of Chattanooga. The project was to develop a disposable diaper superior to any on the market at the present time, but which must be low in price. The diaper had to be soft, absorbent, of high wet strength and of clean white appearance. A survey was made of all the possible structural materials and consideration was given to their functional properties. Cotton fabric is too expensive, paper or paper laminate too stiff, non-absorbent or low in wet strength. The thought then arose that if a cheap fiber web such as garnetted cotton could be bonded with a plastic to give the necessary strength and still be absorbent, an inexpensive, soft absorbent diaper could be obtained. The task then resolved to determine a plastic which would bond the fibers but still be absorbent on one side and another plastic which would also bond but be water repellent on the other side. Such plastics were developed, and so a disposable diaper has been perfected which has already obtained wide market acclaim—a tribute to functional engineering.

Non-woven fabrics may be constructed in three ways:

(1) by chemical action or fusing of the fibers by chemical means.
(2) incorporation of extraneous adhesives.
(3) incorporation of thermoplastic fibers.

The methods available allow the creation of many new fabrics in a very economical manner. The field has only been scratched. It is the author's opinion that this is one way in which the present status of cotton fibers can be improved; since it affords means for creating new economical fields of use. Suffice it to say, however, that the price of the cotton fiber must be reduced to an economic level comparable with rayon and the other fibers. Otherwise several of the good functional properties of the cotton fiber such as high strength, both wet and dry, good moisture absorption, toughness, etc., will be sacrificed for economic reasons.

If we were to expand our illustrations of functional engineering, it would become apparent that many other additives besides plastics can be an essential part of composite construction in textiles. We must consider not only the usual fibers such as cotton, rayon and wool but also asbestos, glass, and even metals. The number of combinations and permutations of available raw materials is now so great that many new products which would represent a substantial improvement over those already in existence are waiting to be borne. One manufacturer is reported

* Presented before the Piedmont Section, Charlotte, North Carolina, October 26, 1946.

already to be experimenting with summer suits woven from extremely fine copper wire coated with a cellulose plastic. The possibilities are limited only by the imagination of the textile engineer.

Fiber Blends

One large division of functional engineering is the field of fiber blends. This subject has received previous treatment by Bruckhaus (3), Thomas (4) and others, but its treatment from a functional engineering standpoint is quite new. Previous blends have been mostly of the two-fiber variety such as cotton and a synthetic, or two types of synthetics; the usual purpose of which was to extend or imitate wool, silk or cotton. The blending of the fibers and the running of blended staple on cotton, wool, or special equipment have been adequately discussed in the literature of recent years. More recently the development of multiple fiber blends, at present mainly three fibers, has captured the imagination of the industry. In order to get particular effects, various functional properties of the different fibers such as the luster of bright viscose, the unique dyeing properties of acetate, the strength and abrasion resistance of nylon, the resiliency of Aralac, the bonding properties of Vinyon, etc. are being used by blending in various proportions. By blending fibers with widely different characteristics, technologists are able to develop fabrics that have the strength, softness, porosity, and resilience desired for any given purpose. Fibers have been reported as being used ranging from 1.25 to 8 denier and from 1½ to 3 inch staple. Blending techniques range from sandwich blends after opening, to a spinning blend of a cover such as Nylon or Fiber A over a filament ground yarn.

By the use of synthetics, novelty effects are easily achieved. By the use of thermoplastic fibers, puckered, ruffled or crinkled effects are easily produced. Resists and novel dye patterns are easily obtained by using fibers such as acetate, nylon, etc.

Viscose rayon can be blended with practically any fiber such as wool, acetate, cotton, flax, ramie, animal hair, Vinyon, Aralac, nylon, and even asbestos with any of which it acts as an excellent carrier. The outcome of the many possible blends and of their twist variations translates itself into a wide variety of fabrics each with a different handle. For example, there is the possibility of producing fabrics for men's wear which will not wrinkle and in which the crease can be set so that the garments will not have to be pressed repeatedly. For women's wear, the possibilities are even broader, such as crush-proof marquisettes, fabrics of increased resistance to soiling from water, stains and perspiration, fabrics allowing unusual dyeing, draping and handle qualities, etc.

Finishing Operations

The application of finishes affords a fertile field for functional engineering in textiles. Qualities other than those inherent in the fiber may be obtained by the choice of the proper finishing operation. Finishes have now been developed which will not only change the hand or appearance of the fiber or fabric but also create water repellency, creaseproofing, shrinkage control, color fastness and resistance to wear, fire, mildew, bacteria and to other conditions detrimental to the performance of the textile.

The older finishes consisted chiefly of the natural materials such as starches, gums, resins and tallows. The newer finishes make use of hundreds of organic polymers and synthetic plastic resins. Chemical or physical changes which finishes exert on fibers depend upon the process employed in their application. The early processes depended for their effects upon a continuous coating which altered the flexibility or hand of the fabric. Later methods have been developed whereby it is possible to polymerize a resin or leave a finish uniformly distributed throughout the fiber, thus producing little affect on the original suppleness of the fibers.

Finishes such as those for crease resistance, water repellancy and shrinkage control are classified as functional finishes. Other finishes may be applied only to improve hand, weave-ability, knit ability, etc. In discussing finishes it has been the intent of the author to mention them only from the standpoint of functional engineering, in an effort to show how they have been used to develop new products or new properties in textiles. These may be itemized as creaseproofing; stabilization, shrinkage and stretch control, water repellency for protective clothing, improvement in tensile strength, and improvement in appearance of certain materials for economic purposes. The latter includes improvements such as imitation linen obtained by treatment of cotton, imitation of expensive furs by treatment of sheepskin, etc. and imitation of wools by treatment of rayon.

Conclusion

It has been the purpose of the author to review some of the past accomplishments in textiles obtained by the application of functional engineering and to show why and how this phase of engineering will be of increasing importance in our industry. The textile chemist and engineer have received many new materials and tools during recent years and now have an opportunity to select the proper material or combination of materials to best meet our present and future textile needs. It is the responsibility of textile technologists to make use of this opportunity.

Whether we realize it or not, functional engineering has brought us to a new concept or philosophy in the textile field which is best expressed in the words of Dr. DeWitt Smith, "The essence of the new textile philosophy is that fibers can be designed to meet specific textile wants rather than that textile wants must be designed to utilize immutable fiber personalities." Recognition of this philosophy and our responsibilities as textile technologists will bring about a new era in which we will create better textiles for better living by the application of functional engineering.

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(1) "A Survey of the Synthetic Fibers" —William D. Appel, American Dyestuff Reporter 34, 21-25 (1945).

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(3) "Modern Mixed Spun Goods—Manufacture, Dyeing, etc." — Walter Bruckhaus, Textil Betrieb, pages 35-40 (1938).

(4) "New Synthetic Textiles in Relation to Wool"—H. A. Thomas. J. Soc. Dyers and Colourists 55, 57-67 (1939).

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(6) Modern Plastics Encyclopedia (1946).

Membership Drive, N.N.E. Section

THE membership committee of the Northern New England Section has been organized and is starting to function. A drive is planned for new members in that section. It is not intended that the committee will interfere with the activities of individual members in this respect but rather to supplement such activities by concentrating them.

Lyman Billings is chairman of this committee and Arthur C. Merrill is secretary.

ABSTRACTS FROM CONTEMPORARY JOURNALS

A Nylon Stocking Symposium

The Textile Manufacturer, page 207, Vol. 72, No. 856, April, 1946.

This is a report of a meeting of the Hinckley Textile Society at which the following papers on nylon were presented:

"Nylon with Special Reference to Hosiery Yarns."

"Seamless Nylons."

"Views on Full Fashioned Nylons."

"Dyeing and finishing of Nylon Hose."

Dr. E. B. Abbot of I.C.I. Ltd. discussed the last topic and pointed out that all-nylon hose are satisfactorily set in the preboarding operation at 240°F. while it is recommended that nylon-cotton hose be set at 260°F. Following scouring and rinsing the hose are dyed in the ordinary way, using dispersed acetate dyestuffs for the nylon and direct dyestuffs for the cotton, if present. All nylon hose are satisfactorily dyed at 180-185°F., but where cotton is present higher temperatures are recommended to assist penetration. The choice of dyestuffs for nylon should be governed primarily by compatibility in dyeing rate coupled with the best possible washing fastness. The direct dyes selected for the cotton should not stain the nylon or they should be dyed under suitable alkaline conditions. To obtain the best performance the application of an anti-snag finish is recommended.

The Scientific Approach to Problems Connected with Wet Chlorination of Wool Textiles and Mixtures, Particularly Hosiery and Yarn

W. A. Edwards, Papers of the American Association of Textile Technologists, page 9, Vol. 2, No. 1, July-November, 1946.

The author summarizes the various treatments as follows:

Treatment with aqueous solutions of the halogens, particularly chlorine and bromine.

Treatment with gaseous chlorine, definite moisture content of wool essential.

Treatment with reagents dissolved in an organic solvent.

Treatment with alkali in an organic solvent.

Processes in which the wool is coated or impregnated with a resin or polymer or similar substances.

Formation of a polymer within the fiber.

In deciding the type of process to be used the author cites the following points to be considered:

Ease of manipulation and convenience to workers.

Productivity.

Initial cost, cost of upkeep of plant, and whether adaptable for other processes.

Cost of labor and materials.

Simplicity and degree of control.

Effect on other fibers.

Effect on other valuable properties of wool fiber.

Effect on colored stripings, etc.

The greater portion of the author's remarks are confined to the application of the Negafel process (wet chlorination).

The Production of Fast Shades on Knitted Cotton Fabrics, Nets and Lace

E. R. Wiltshire, Journal of the Society of Dyers and Colourists, page 313, Vol. 62, No. 10, October, 1946.

Methods of dyeing vat and Soledon dyes on knitted cotton fabrics, nets and lace on the winch machine are described. Means of overcoming frothing and oxidation difficulties with vat dyes are suggested, and a general method of dyeing a selection of the faster-to-light Soledon dyes without removal from the winch, based on washing between dyeing and developing, is described.

The Use of Polymers to Make Wool Unshrinkable. Part II—Diisocyanates

T. Barr, C. W. Capp and J. B. Speakman, Journal of the Society of Dyers and Colourists, page 338, Vol. 62, No. 11, November, 1946.

Investigation was made of the possibilities of using di*iso*cyanates in making wool unshrinkable by effecting cross-linking reactions. Best results were obtained when fabric was immersed in a pH 8 buffer solution, centrifuged, and then treated for 6 hours at 70° C. with 20% by weight of *m*-phenylene di*iso*cyanate dissolved in white spirit, using a liquor-wool ratio of 40:1. However, the method of treatment suffered from two defects: the time of treatment was unduly long and a large part of the di*iso*cyanate remained in solution. A high degree of unshrinkability was imparted to flannel by successive 5 minute treatments at 25° C. with 1% solutions of *m*-phenylene di*iso*cyanate and hexamethylene diamine in white spirit—two treatments with each reagent—the gain in weight being about 14%. Better results were obtained by applying 8% by weight of di*iso*cyanate and diamine to flannel from solution in benzene, and then baking the fabric for one hour at 100° C.

"Terylene"—A New Synthetic Fiber

Canadian Textile Journal, page 29, Vol. LXIII, No. 22, November 1, 1946.

"Terylene" is a new synthetic fiber produced from a polyester derived essentially from terephthalic acid and ethylene glycol. It is the result of research work initiated by the Calico Printers' Association (England). Subsequent research work on the chemical polymer and its conversion into a textile fiber will be carried out by Imperial Chemical Industries who have acquired an exclusive license covering the whole world outside of USA. Multifilament yarns of widely different characteristics may be obtained by varying the physical and mechanical operations of spinning and processing. It is said to have markedly high resistance to light and to heat. It has a high initial elastic modulus so that a relatively high load is required to produce a small extension. The product is further said to be highly resistant to micro-organisms and bacteria, to have good general chemical resistance, to have very low moisture absorption, can be heat set, to have good resilience and a high ratio of wet to dry strength. The fiber presents problems in dyeing and research is proceeding.

It is anticipated that it will be a matter of years before the fiber is available in appreciable quantities.

The Nature of the Dye-Chromium-Fiber Complex in the Case of Wool Dyed with Certain Chrome Mordant Dyes

E. Race, F. M. Rowe and J. B. Speakman, Journal of the Society of Dyers and Colourists, page 372, Vol. 62, No. 12, December, 1946.

The only possible combinations of complex and fiber appear to be salt linkages between chromium and sulfonic groups in the complex and amino groups in the fiber. Thus, the complex, once it is formed in the fiber, is, in effect, an acid dye of high molecular weight and the increased fastness properties of the chrome dyeings as compared with corresponding unchromed dyeings must be attributed to the fact that the lake, having a molecular size more than double that of the parent dye, is bound to the fiber by van der Waals forces which are commensurate with its size, and to the possibility that the lake molecules, having been formed *in situ*, are too large to escape from spaces which were large enough to allow initial entry of individual dye molecules and chromium ions.

• PATENT DIGEST •

Opening Webs in Rope Form B, 3

U. S. Pat. 2,411,414 (P. Cook—Nov. 19, 1946)

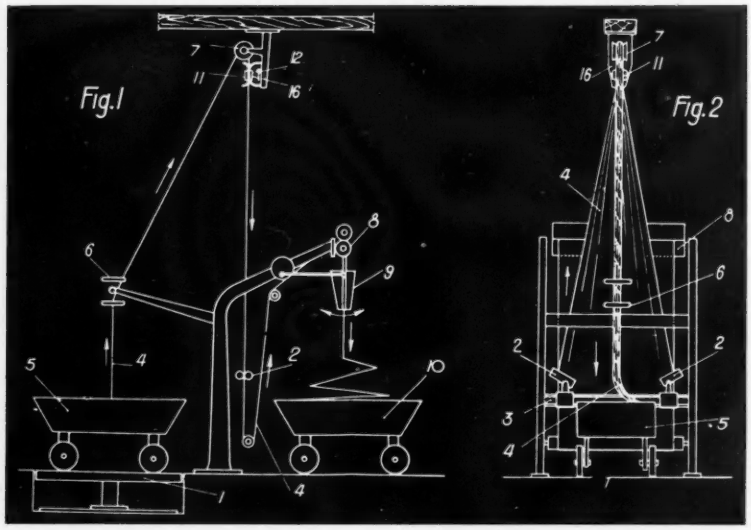
A longitudinally traveling web in rope form, as it occurs in bleaching or dyeing has to be opened again for the subsequent work for instance for printing or finishing. Many devices, suitable for untwisting (opening) such ropes have been described. The present invention is especially intended to *handle delicate fabrics.* The inventor formerly obtained U. S. Pat. 2,248,962, consisting principally of a mechanism wherein the web passes between two rollers, carried by a frame. This frame can be driven by a reversible electromotor in either direction to untwist the rope. An attendant operating the motor and watching the twist of the running rope is of course needed in this system. The present invention improves this device by inserting two "electric eyes" (26) and (26a) in the path of the rope. According to the movement of the rope, coming from the turntable (18)—Fig. 2—either one or the other eye being covered activates automatically the motor in one or the other direction.

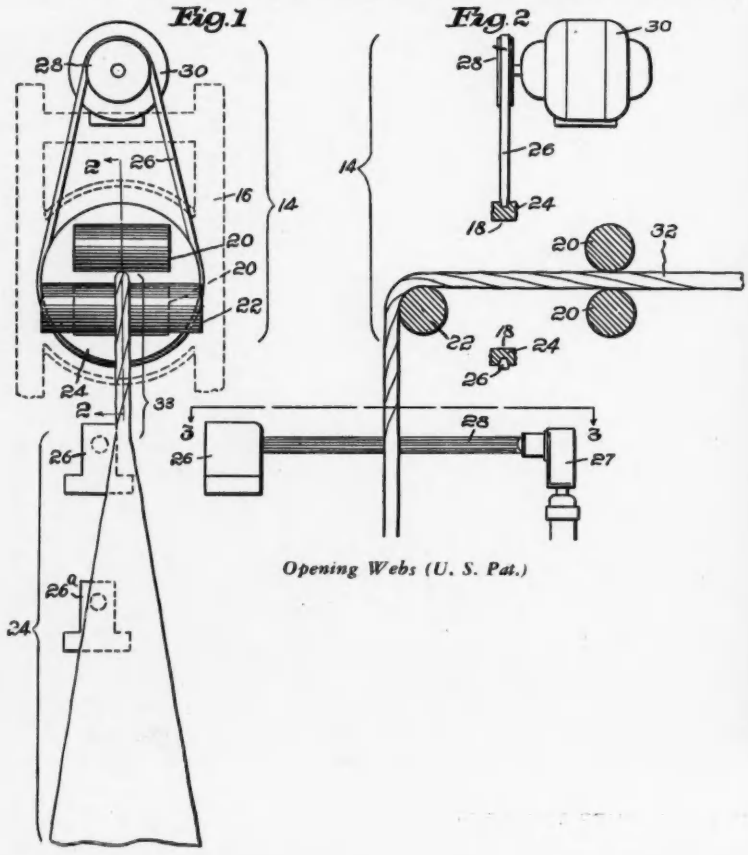
Reference: One of the prior inventions intended to avoid the vehement action of members, beating the rope strongly to

PAUL WENGRAF

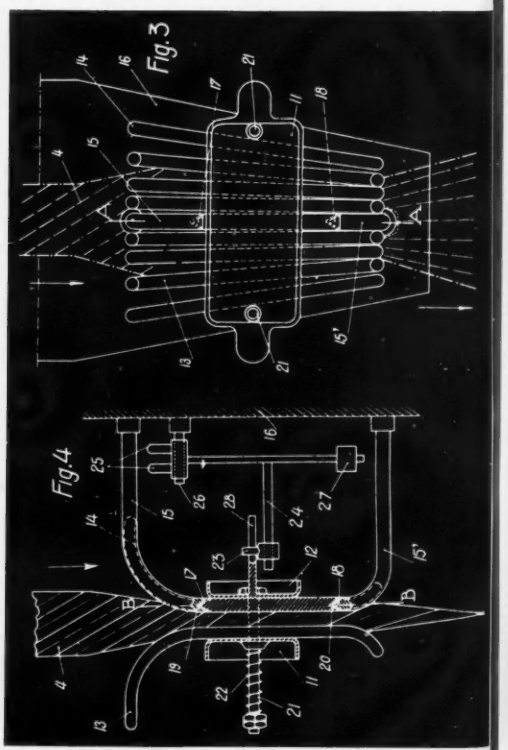
open it by mechanical impact, might be mentioned here: French Pat. 808,660 (Jul. Dungler) comprises two turn tables, one of them containing the fabric in rope form, the other one the fabric delivered in open form. Here the torsion of the rope itself acts in passing through a slot over a series of movable plates. These plates are connected with the table on which the rope is placed. A clockwise twist acts here therefore by moving

Opening Webs (French Pat.)





Opening Webs (U. S. Pat.)



the turntable counter clockwise as is seen in figures 1 and 2 of the French Patent.

Printing Solubilized Vat Dyestuffs—Adding Caffeine D, 2, 04

U. S. Pat. 2,406,586
(Allied Chem. & Dye Corp., Clark, Aug. 27, 1946)

The sals of acid esters of leuco-vat-dyestuffs, known by their commercial names as "Ponsols" or "Indigosols," are very valuable and stable forms of these leuco compounds. They are readily soluble in water and their solutions are not affected upon exposure to the air. Moreover they are very substantive to N-containing and natural animal fibers (wool, silk, casein fibers, also nylon). They are easily re-oxidized to the parent vat-dyestuff by a mild treatment with nitrites or with acid chromates or by incorporating substances, reacting as oxidizing agents only upon contact with acids. These methods have been disclosed in U. S. Pat. 1,575,958 of March 9, 1926 (Durand & Huguenin-Bader, the inventor of the Indigosol process). The ester salts mentioned here above lack however stability when made up in printing pastes. Their strength decreases considerably on standing for some time. Some of these products have also a poor solubility. The stability of the printing paste is substantially increased — according to the present invention—by incorporating therein *a xanthinic base* (preferably *caffeine* = methylxanthin, theobromine) which has a pH of more than 7 in aqueous solution. The effects are: improved solubility, brilliancy, stability. It is especially interesting to learn that the blue-green vat dyestuff, National Carbanthrene Blue-Green FFB (Colour Index 1173) which is otherwise difficultly soluble so that it cannot be dispersed in a printing paste, can easily be used after adding caffeine (amount: 1-5 times calculated on the quantity of dry dyestuff). Caffeine is the trimethyl derivative of a complicated nitrogen base, related to urea. As the name says it has been found in coffee beans and it has later been identified with "thein," isolated from tea-leaves. It is a crystalline substance, very soluble in water and volatilizing at 150° C.

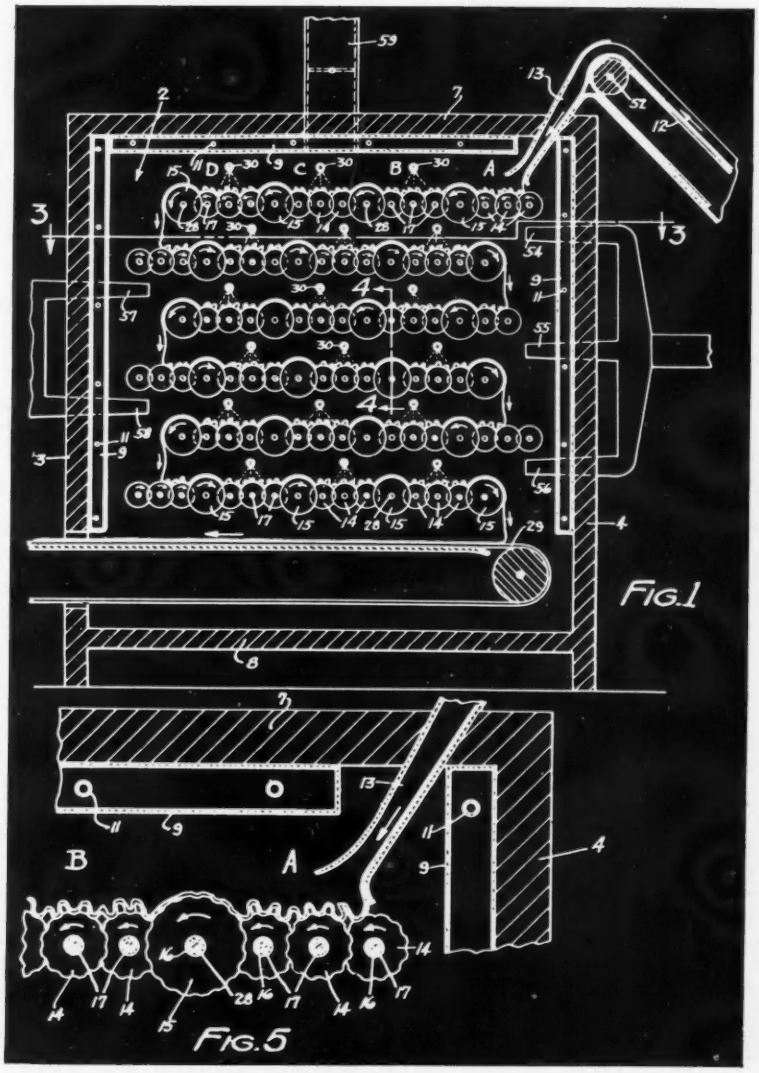
Shrinking Device G, 3

U. S. Pat. 2,409,543
(Munsingwear Inc., Chatfield, Oct. 15, 1946)

In manufacturing textile fabrics and particularly in processing (bleaching, dyeing, etc.) knitted goods, the fabric is usually under tension. Fabrics which have not been restored to their normal condition by relaxing the threads are very likely to shrink in subsequent washing operations. Thus the finished fabric is generally put through a pre-shrinking process. A machine for carrying out this operation is protected by the present invention. The principal feature of the method is to convey the fabric through a steam filled chamber without exerting a pulling or pushing action in such a way that a plurality of small wrinkles are periodically formed and gently straightened out again. It can be seen from Fig. 1 and from an enlarged part thereof in Fig. 5 that the fabric is led from the right upper end of the chamber to groups of (three) smaller rolls (14), these groups being marked with "A," "B" "C," and "D." Disks (15) of a greater circumference and, rotating at a higher speed than the rolls (14) are placed after each group A, B etc. The speed of (15) corresponds to that of the fabric at the point where it is delivered to the chamber by conveyor (12). It can be seen that the fabric is periodically inverted on its path from upward down. A discharge conveyor (29), traveling at exactly the same speed as the conveyor (12) removes the relaxed fabric. According to the material to be shrunk the ratio between the peripheric speeds of rolls (14) and (15) can be changed.

The process, described here above, does not give the fabric a predetermined size, corresponding to the shrinkage to be expected (like in the Sanforizing process, see for example U. S. Pat. 1,971,-211). It tends only to restore the natural degree of stretch by a simple steaming process. Some analogy might be found in former suggestions comprising feeding fabrics in folded loose state to a (needle-) tenter frame in order to allow the fibers to relax during the tentering operation (see a.o. Swiss Patent 177,228, Jahr, or Brit. P. 420,769, Krantz).

Shrinking Device



TRADE NOTES • NEW PRODUCTS

OBITUARY

WILLIAM M. WENTZ

WILLIAM M. Wentz, 45, a member of the Technical Laboratory staff of the Du Pont Company's Organic Chemicals Department, died in Worcester, Massachusetts, March 13. He was widely known for his research on dyestuffs applications. His extensive knowledge of dyeing techniques brought him prominence in the field as did several outstanding contributions which he made to coloring processes.

Among these were a patent for application of vat dyes to animal fibers and to cellulose acetate rayon when woven in combination with cotton; a method for dyeing loose wool with indigo in a continuous operation and assistance in developing methods for coloring the U. S. Navy blue wool uniform cloths in a continuous operation.

For the past five years Mr. Wentz was engaged in developing application techniques for the continuous dyeing of wool in all stages of manufacture. He developed mechanical means of coloring woolen cloth with acid, chrome and vat dyes in a continuous operation without subjecting the cloth to destructive tension and was perfecing this apparatus, known as the Multi-Lap Process, at the time of his death. A patent for this process was granted on February 20, 1945. Application for other patents are pending on improvements in dyeing that he invented.

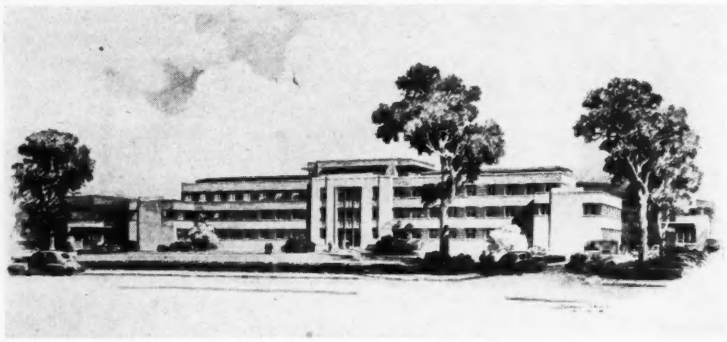
A native of Wisconsin, he was first employed by the Newport Chemical Company as a laboratory boy at the age of 16 and had risen to the position of Chief of Dyestuffs Production Testing when Du Pont acquired the Newport Company in 1931. He continued in the laboratory at Carrollville, Wisconsin, for several years, then was assigned to Technical Laboratory, Deepwater Point, N. J., in 1938.

• Manager, Chemo-Textiles

William J. Harrison has been appointed Manager of Chemo-Textiles, Inc., West Warwick, Rhode Island. Mr. Harrison will direct production, research and sales development of resin treated yarns.

Mr. Harrison is a native of Rhode Island and graduated in 1926 from the Rhode Island School of Design. He has been Manager of a Southern yarn bleachery, Director of Research for a large Southern mill and recently with the textile technical department of Monsanto.

• Carbide Plans New Research Center At South Charleston



Construction of a new research center for Carbide and Carbon Chemicals Corporation at South Charleston, West Virginia, is now underway, according to an announcement by the Corporation. The new center will replace existing facilities, and will eventually house the fundamental research activities of Carbide and Carbon Chemiacls pertaining to new organic chemical and resin producing processes. Upon its completion, the present research unit will provide additional process control laboratory facilities for the company's South Charleston plant.

The new center, for which building drawings are already substantially completed, will be located on part of a 140-acre tract recently acquired in South Charleston about a mile from the company's plant. Authorization to proceed with site preparationy, foundations, and structural steel erection has been obtained from the Civilian Production Administration, Office of Temporary Controls. Further construction will proceed as rapidly as CPA approval can be obtained, dependent upon availability of construction materials.

Shown above, is an architect's drawing of the main three story building. The building will house laboratories, offices, a library and many special facilities.

• Rainwear Fashion Show

A fashion show of rainwear traced the history of the raincoat from the time of Eve up to present-day styles on March 26th in the Rainbow Room at 30 Rockefeller Plaza, as Miss Ilka Chase, noted author and fashion authority, narrated. The show featuring Norane, the durable water-repellent, was sponsored by the Warwick Chemical Company and Conover Cover Girls modelled.

The occasion of the showing was to reveal to the public the role that modern chemical research has played in transforming the cumbersome costumes of yesteryear into the colorful and functional styles of today, Ernest Nathan, president of the company, explained.

"In the past, the rain garment was more an unpleasant necessity, than a practical, useful object. But today, the modern Norane-treated raincoat is not only a fully useful item, but a beautiful addition to the wardrobe of modern living, as well," he declared.

He added that the water-proof, unwieldy coats of former years were rain garbs which overheated the wearers since the fabrics could not "breathe." Today's water-repellents, Mr. Nathan continued, are invisible and can be applied to any type of fabrics without closing the "pores" of the material. Thus, air can permeate, but rain cannot, and the wearer does not get too warm but achieves a high degree of comfort.

The period rain costumes of the show ranged all the way from that of "Eve" in an abbreviated costume of leaves to a Korean native of several centuries ago, whose only protection was straw clothing, through the sixteenth century in Holland and the eighteenth century in England and Germany. The display included the flamboyant flapper of the wild 1920's in America and the smartly tailored Navy WAVE raincoat of the 1940's. The final coats exhibited were those of a man and a woman whose ultra modern Norane-treated rain apparel were repeated to the last detail of styling in the raincoats of a boy and a girl. A strik-

ing black evening raincoat made of a glossy fabric and trimmed at the dollar and cuffs with glittering green sequins, constituted the finale.

• Sales Manager, du Pont Fine Chemicals

Charles T. Mentzer, Jr., 39, assistant sales manager of the Fine Chemicals Division of the Du Pont Company's Organic Chemicals Department, has been named sales manager, effective April 1. He succeeds Charles Spencer Rowe, who died March 1.

Mr. Mentzer, who was born October 12, 1907, in Hagerstown, Maryland, joined the Du Pont Company as an analytical chemist at the Jackson Laboratory immediately after graduation from the Johns Hopkins University in 1929, with a bachelor of science degree in chemistry.

He was transferred to the Technical Laboratory, as a research chemist, in April, 1931, where he served until February, 1937, when he was named a salesman in the Organic Chemicals Department's Chicago office. On February 1, 1942, he was recalled to Wilmington as assistant to the director of sales of the Fine Chemicals Division. He was promoted to assistant sales manager on July 1, 1944.

• Appointed Seminar Leader

Dr. Milton Harris has been appointed seminar leader for the National Textile Seminar, to be held at Shawnee-On-Delaware, near Stroudsburg, Pennsylvania, May 12th to 16th inclusive.

Announcement of the appointment was made by Dean Richard S. Cox, of the Philadelphia Textile Institute, which is sponsoring the seminar.

Approximately 200 textile leaders from every section of the country, including top executives and technologists, will attend the seminar. Results of recent research will be presented and all phases of the industry's problems discussed.

• "Karbate" Seven Tube Heat Exchanger

Seven tube "Karbate" Impervious Graphite shell and tube heat exchangers for use under highly corrosive conditions are now available from National Carbon Company, Inc., 30 East 42nd St., 17, N. Y., in three standard sizes of 4'3", 7'3" and 10'3" length. All three units employ 1" I.D. x 1½' O.D. "Karbate" tubes in bundles encased in standard 6" I.D. steel pipe shells. The exchangers are identical in every respect except for pipe length and the number of "Karbate" baffles, and all tube bundles and shells of the same size are interchangeable.

The units can be employed as heaters, coolers, boilers or condensers, and can be operated vertically or horizontally. They will carry temperatures up to 338°F (170°C.) and a working pressure of 50 lbs./sq. in. on both the tube and sheell sides. Standard nozzle connections permit ready installation with piping connections of almost any material of construction. Water, brine or steam are suitable on the shell side.

A new bulletin, Catalogue Section M 8808, describing these heat exchangers is available.

• Nopco Chemical Company

At their annual meeting on Thursday, March 27, 1947, stockholders of National Oil Products Co. voted to change the company's name to Nopco Chemical Co., in order to identify the company more readily with the chemical industry.

• Joins American Thread

James McGowan has resigned his position as a Metropolitan District Sales Representative of the Dyestuff Department, Calco Chemical Division, American Cyanamid Company, to join the American Thread Company as assistant to chief dyer.

Mr. McGowan obtained much of his experience in textile dyeing in the Calco Application Laboratories at Bound Brook, N. J., where he was employed for seven years following his graduation from Plainfield High School, Plainfield, N. J., in 1930. After two years with the Newark Textile Dyeing & Finishing Company, as second hand to the dyer, Mr. McGowan went with the American Thread Company in charge of package dyeing at their Willimantic, Connecticut, plant. He joined the Calco Metropolitan District Sales Staff of the Dyestuff Department in 1945.

• Awarded I.R.I Medal

Dr. Charles A. Thomas, vice president and technical director of Monsanto Chemical Company and one of the key figures in the development of atomic energy, has been awarded the 1947 Industrial Research Institute Medal, presented for outstanding contributions to the field of industrial research, it has been announced.

The Institute, composed of 88 companies representing diversified types of industry throughout the nation, cited Dr. Thomas for his "contributions to the administration and management of industrial research." The medal will be presented June 5 during the annual meeting of the Institute at Swampscott, Mass. Previous recipient of the award, which was established last year, was Dr. Willis R. Whitney, organizer of the General Electric Research Laboratory.

Dr. Thomas, one of a group of scientists to receive the Medal of Merit from Secretary of War Robert P. Patterson in March, 1946, was also one of five coauthors of "A Report on the International Control of Atomic Energy," prepared for the Secretary of State's Committee on Atomic Energy. He is director of the Clinton Laboratories at Oak Ridge, Tenn. In December, 1946, Dr. Thomas was elected president of the American Chemical Society in nationwide balloting by approximately 50,000 members of the society.

• Screen Table Adhesive

A new screen table adhesive, manufactured by National Adhesives of New York, is said to do away with the time-consuming method of nailing or pinning cloths or silk screens to printing tables, both in textile printing and silk screen printing processes.

The screen printing-table adhesive—Resyn Adhesive Q3613—holds unprinted cloth to the screen table during the printing operation. Adhesion is sufficient to prevent slippage of the material during printing, yet tests are said to have shown that the cloth is readily removable after the printing has been completed, with no adhesive sticking to the printed cloth or in any way damaging it.

Resyn Adhesive Q3613 is a light grey emulsion that should be used as supplied. Field tests, according to National's technicians, show that the new product maintains sufficient tack for screen table printing for a period of several weeks. National points out, however, that the working life of the adhesive will be cut where the cloth being printed on is fuzzy or leaves deposits of lint.

The adhesive has been perfected by National Adhesives, affiliate of National Starch Products, Inc., 270 Madison Ave., New York 16, N. Y.

• Awarded Schoellkopf Medal

The Jury of Award of the Western New York Section of the American

Chemical Society has awarded the Jacob F. Schoellkopf Medal for 1947 to Dr. Leo I. Dana, manager of research for The Linde Air Products Company and its associated Units of Union Carbide and Carbon Corporation. Award of the medal was made for Dr. Dana's scientific work while a member of the Western New York Section, particularly in the solution of a major distribution problem in the chemical industry.

The award jury's report referred to the laboratory efforts directed by Dr. Dana which led to making large shipments of liquid oxygen and nitrogen "available to industry in a safe and industrially practical manner."

Dr. Dana, who was born in Boston in 1895, was graduated from Massachusetts Institute of Technology with a B.S. degree in 1917, and went directly to the United States Bureau of Standards as an assistant physicist. His work there from 1917 to 1919 led to his recognition as an expert on the measurement of high temperatures. He returned to graduate school at Harvard University, and in 1922 received his Ph.D. degree. Dr. Dana joined the staff of The Linde Air Products Company Laboratory in Buffalo in 1923. In 1931 he became director of the Laboratory, which position he held until 1943.

• Building Program, Lowell Textile

The first step in the post-war building expansion program of the Lowell Textile Institute took place March 18th when Samuel Pinanski, vice-chairman of the board of trustees and president of the Lowell Textile Institute Building Association, broke ground for the first of two dormitory units recently authorized by the Massachusetts legislature.

The ceremony, signalling the actual start of construction, was witnessed by President Kenneth R. Fox of the Institute; John J. Desmond, Jr., Commissioner of Education for Massachusetts; Harold W. Leitch, chairman; and other trustees, faculty and student body. Governor Robert F. Bradford of Massachusetts was unable to be present at the breaking of ground due to the pressure of duties but sent a telegram of congratulations to the members of the Building Association and the trustees complimenting them on the great work being done on behalf of the Institute.

The dormitories are being erected on Moody Street, facing the present Institute buildings. It is hoped to have the first of the two units ready for occupancy by late fall. It will consist of a basement containing a large modern cafeteria and 4 stories of students rooms, accommodating 110 students and quarters for a faculty proctor.

The second building, to be completed somewhat later, will also house 110 students and have a large recreation room in the basement. The two buildings, first step in an ambitious expansion program at the Institute, will fill a very pressing need. At present, the student body of nearly 500 is scattered over the city and suburbs in private homes. With a still larger enrollment in prospect for next year, the housing situation will become even more acute.

The completion of the dormitories will make possible a real college atmosphere with students living on the campus with adequate eating and recreational facilities.

The buildings are being erected on a self-liquidating basis under a plan authorized by the Massachusetts legislature. The Lowell Textile Institute Building Association, a private corporation, has been set up with power to borrow the necessary funds and construct the dormitories. The loan will be repaid out of income from student rentals and the property, when paid for, reverts to the state. Members of the Building Association are: Thomas F. Costello, Lowell; Roland E. Derby, Tyngsboro; Albert J. Gilet, Lowell; Harold T. Godfrey, North Andover; Walter J. Hamburger, Dedham; Ralph K. Hubbard, Webster; Harold W. Leitch, Andover; Carleton J. Lombard, Chelmsford; Francis P. Madden, Winthrop; E. Perkins McGuire, Boston; Samuel Pinanski, Brookline; and Ernest D. Walen, Andover.

Marion & Sons of Lowell are the contractors and Krokyn & Browne of Boston, the architects, for the new buildings.

• Conference on Clothing

Thirty-four specialists including home economics in textiles and clothing, sociologists, psychologists and business economists from thirteen outstanding educational institutions met together recently (March 10 to 16) at Teachers College, Columbia University, in the first conference of its kind to discuss the problems of clothing as related to the social sciences and to explore the possibilities of undertaking needed research. Participants were invited from colleges which have both a strong supporting department in a social science field and a home economist interested in stimulating a joint research program in certain aspects of textiles and clothing as related to economics, sociology and psychology.

The conference, initiated by a committee of the Home Economic Section of the Association of Land Grant Colleges and Universities, was co-sponsored by the Research Committee of the Textile and Clothing Division of the American Home Economics Association. Dr. Laura Drummond, Teachers College professor of home economics, was chairman of the planning committee.

Three specific areas of research were defined by the conference participants who emphasized the need for more information on the relation of clothing to such things as income, development of the individual, social participation, age, region of residence, occupational needs and type of community.

Colleges and universities participating in the work conference included the University of Tennessee, University of Illinois, Cornell University, Drexel Institute of Technology, University of Washington, Iowa State College, Pennsylvania State College, Purdue University, Brooklyn College, Kansas State College, Michigan State College, Ohio State University, University of Alabama, and Teachers College, Columbia University. There were also representatives from the United States Office of Education and the Bureau of Human Nutrition and Home Economics.

• Flotex

Reports from the textile printing field are said to indicate wide application of "Flotex," a product of National Starch, as a printing thickener. In many cases, it is said to serve as a replacement and extender for relatively more expensive natural gum thickeners, such as Gum Tragacanth, alginates, and locust bean gum.

Experience has shown, National claims, that Flotex produces textile prints with superior color yield, compared with that obtained from natural gums.

A colorless, clear-cooking starch derivative which gelatinizes to a heavy-bodied, smooth, non-jelling paste, Flotex is said to possess excellent stability in the presence of acids, alkalis and other chemicals commonly used in textile printing. It has high viscosity with low solids.

It is stated that, because of its long flowing, non-jelling properties, Flotex has been found especially suitable for use with Aniline, Diphenyl and Logwood Blacks. Flotex is said to produce jet blacks with extremely sharp outlines.

Dyestuffs with which Flotex is claimed to work extremely well as a thickener include Rapidogen, Pharmasol, Algosol, Indigosol, Naphthol and Chrome. Further uses of Flotex are indicated in white discharge and caustic plisse printing, and for application in gum rollers and peroxide padding, according to the manufacturer, National Starch Products Inc., 270 Madison Ave., New York City.

Synthetic Fibres

(Continued from Page 192)

rics. Only a few substantive dyes can be dyed from neutral baths that is without soda, and from alkaline baths the dyes are hardly absorbed at all. Most substantive dyes require, as they do on animal fibers, the addition of acid. They can be dyed from an acetic acid bath. To obtain better leveling it is, however, advantageous to use ammonium acetate or ammonium formate with the addition of Glauber's salt at the beginning of the dyeing process and only when necessary to add acetic acid at the end. In this manner many substantive dyes can be used to dye Perlon satisfactorily. It is of interest to note that, when necessary, it is possible by pre-treatment with suitable swelling agents or by the addition of certain swelling agents, such as β-naphthol, to the dye bath to materially increase the affinity of substantive dyes. Only in recent times have such processes become known and patented in England.

The shade of substantive dyes on polyamide fibers differ considerably from their shades on neutral fibers. The shade change is similar to that obtained with such dyes on animal fiber.

Light fastness of substantive dyes on polyamide fibers in most cases is normal although in some cases somewhat poorer; however in many cases it is even better than in viscose silk. The wet fastness is in most cases very good and in general better than that on viscose. Certain substantive dyes can be after-metallized on polyamide fiber. For example, the "Benzo Fast Copper" colors can be dyed with the addition of ammonium formate and finally coppered. The coppering process does not in general proceed normally, and the complete coppering is obtained only by the addition to the coppering bath of suitable assistants. For this purpose such products as Leonil SB are suitable. In this manner dyeings of very good light, wash and wet fastness are obtained.

The diazotation and development of substantive dyes on polyamide fabric is possible. Diazo colors are dyed similarly to the substantive dyes. With respect to leveling properties, the discussion which has been used in the case of acid colors or substantive colors is applicable. Diazotation must be carried out under somewhat better controlled conditions. It proceeds normally however, and dyeings of good wash fastness properties are obtained.

Naphthols

Naphthol AS dyes cannot be applied by the methods used for cotton. However, certain combinations can be applied by the special procedure worked out for acetate fabrics. The naphthol with the minimum quantity of sodium hydroxide is dissolved and together with the base dyed on the fiber in one bath and either in the same bath or better in a fresh bath with the addition of nitrite and acid, diazotized and at the same time coupled. By this procedure dyeings of brilliant shades with good properties are obtained.

Sulfurs and Vats

With the discussion of Naphthol AS dyes, the field of fast dyes has been touched upon and you will ask how sulfur colors and vat colors behave on polyamide fibers. With regard to sulfur colors it can be stated that most colors of this class are not absorbed from the normal sodium sulfide bath. There are however, a few "Immedial" colors which have good affinity and which have good wash and crocking properties. However, these dyes, for the most part, show only moderate light fastness so they can hardly be of any importance in dyeing of polyamide fibers. It is interesting to note that a number of "Immedial" colors can also be dyed from a hydro-sulfate-ammonia vat or from a type of acid vat. With respect to the fastness properties of such colors, the comments made with respect to sodium sulfide vat is applicable. As a black of this type, only Indocarbon can be considered.

"Indanthrene" colors do not in general dye Perlon by the procedure normally used for the dyeing of cotton. However, it is found that by suitable steaming or by increasing the temperature of the bath to 80-85°C., a large number of "Indanthrene" colors show satisfactory affinity. To dye at higher temperatures it is necessary to use a larger amount of hydrosulfite. Rongalite is known to be more stable at higher temperatures than hydrosulfite and under these conditions a mixture of sodium hydroxide and Rongalite in place of the hydrosulfite can be used. This procedure is patented in England. However, with certain precautions, it is possible to dye with hydrosulfite alone in which case the addition of Dekol or glucose for stabilizing the bath is to be recommended. The final oxidation of this dye on the fiber proceeds in some cases more difficultly than on animal fibers so that it is necessary to oxidize with sodium perborate or sodium percarbonate at high temperatures.

By soaping the so-produced "Indanthrene" dyeings it is, unfortunately, found that a number of dyes, especially with deep shades, show much poorer crocking fastness. This is a peculiar occurrence and can only be explained by the fact that by hot after-treatment of the dye, crystallization to larger aggregates takes place and these migrate to the surface. Unfortunately, it is also observed that vat dyes for the most part show abnormally poor light fastness.

It seems that this is caused by the dyestuff not being completely oxidized on the fiber or that under the influence of light, the dyestuff undergoes a reduction on the fiber. Nevertheless there are a number of vat dyestuffs which have normal light fastness properties and which otherwise have good fastness properties. It can be concluded from this discussion that when the dyeing of polyamide fibers is carried out with vat dyes it is necessary to very carefully choose the dyes used. The same observations are applicable to the "Anthrasol" colors. Any "Anthrasol" color can be dyed from a neutral hot bath. By the addition of acid to the dyebath, their affinity is even greater. Oxidation is carried out most effectively with nitrite and acid in a hot bath. Many "Anthrasol" colors also can be developed with the use of potassium bichromate and sulfuric acid. From what has already been said, it is apparent that in the case of "Anthrasols," a very careful selection is necessary and it must, unfortunately, be pointed out that only relatively few "Anthrasols" are really valuable for the dyeing of Perlon.

We have given a brief survey of behavior of various classes of dyestuff on polyamide fibers and we will now discuss the field of mixed fabrics.

Mixed Fabrics

As we have already pointed out, Perlon in the form of staple is of great importance for mixing with wool and with cellulose staple, since the addition of relatively small amounts of Perlon greatly increases the wearing qualities of the mixed fabrics. From the previous discussion of the behavior of various classes of dyestuffs, the possibility of dyeing such mixed fabrics has already become apparent. For example, mixtures with wool can be dyed by suitably selected acid dyestuffs, the absorption on both types of fiber being controlled by suitable addition of acid to the bath. Where it is necessary to dye the polyamide fiber deeper "Celliton" dyes are added to the bath. Where the polyamide fiber absorbs more dyes than the wool, differences in dyeing properties can be corrected by the addition of a suitable "resist" material or by the addition of such materials to the dye bath which decreases the rate of dyestuff absorption. Suitable assistants for this purpose are organic compounds containing sulfo groups which are preferentially taken up by the fiber and, since they react with the active groups of the fiber decrease the amount of dyestuff which is taken up by the fiber. Such material are for example, Eulan New, Nekal BX, Igepon T, Setamol WS and others.

To produce fast dyeings, selective diazo colors can be used or suitable "Palatine Fast," metachrome or top-chrome colors can be applied. In certain cases it is pos-

sible to dye the wool before spinning with fast wool colors and to dye the polyamide fiber with vat colors also before spinning.

Mixed fabrics of cellulose staple and polyamide fiber can be dyed with various classes of dyestuffs. For example, substantive dyes in combination with "Celliton" colors or also in combination with acid dyes can be used. In the latter case the dyeing is carried neutral followed by the addition of acids or ammonium acetate or ammonium formate at the end of the dyeing operation in order that the acid colors will be taken up by the polyamide fiber. By the addition of Katanol WL or SL the rate of absorption of the substantive dye of the polyamide fiber is decreased. It is also possible to dye these mixed fabrics with diazo colors in combination with fast-to-washing acid colors which are stable to the diazo procedure. Vat dyes also can be used to dye such mixed fabrics. In this procedure the dyestuff absorption by the two fibers is controlled by regulating the temperature.

Since polyamide fibers may be dyed with acetate, dyes which leave wool and cellulose essentially uncolored, and since wool colors and substantive dyes, under the proper conditions, dye polyamide fiber only slightly, it is possible to produce white and colored effects with such fabrics.

This brief discussion of the dyeing of mixed fabrics will have to suffice for the present. Plant scale trials in this field have, of course, not as yet been carried out for such mixed fabrics have not been produced on a large scale as yet. It can only be pointed out that there are many possibilities in the dyeing of these mixed fabrics. However, it should also be pointed out that the dyeing of these mixed fabrics is not always simple and a very careful selection of dyestuffs is essential.

The use of various dyestuff classes for discharge printing and for printing on polyamide fibers has also been exhaustively studied. This field also is to have many possibilities in practical use.

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $7.50 per column inch or less per insertion.

WANTED: SALESMAN — With knowledge of dyes and textile specialties, and experience and personal contacts to cover the South for reliable firm, who has business established in southern mills. State age, selling experience, details and salary expected. Prefer one living in South. Write Box 188.

WANTED: Textile Colorist for Modern Print Shop in the Metropolitan Area. Write Box 197.

POSITION WANTED: Hosiery Dyer with several years experience on ladies' hose of Silk, Nylon, Rayon and Cotton. Available for employment on request. Either as Head Dyer or Assistant to Head Dyer. Write Box 198.

DYESTUFFS WANTED, ALL TYPES, LARGE AND SMALL QUANTITIES, EXCESS INVENTORIES, ALSO INTERMEDIATES AND CHEMICALS. Write Box 171.

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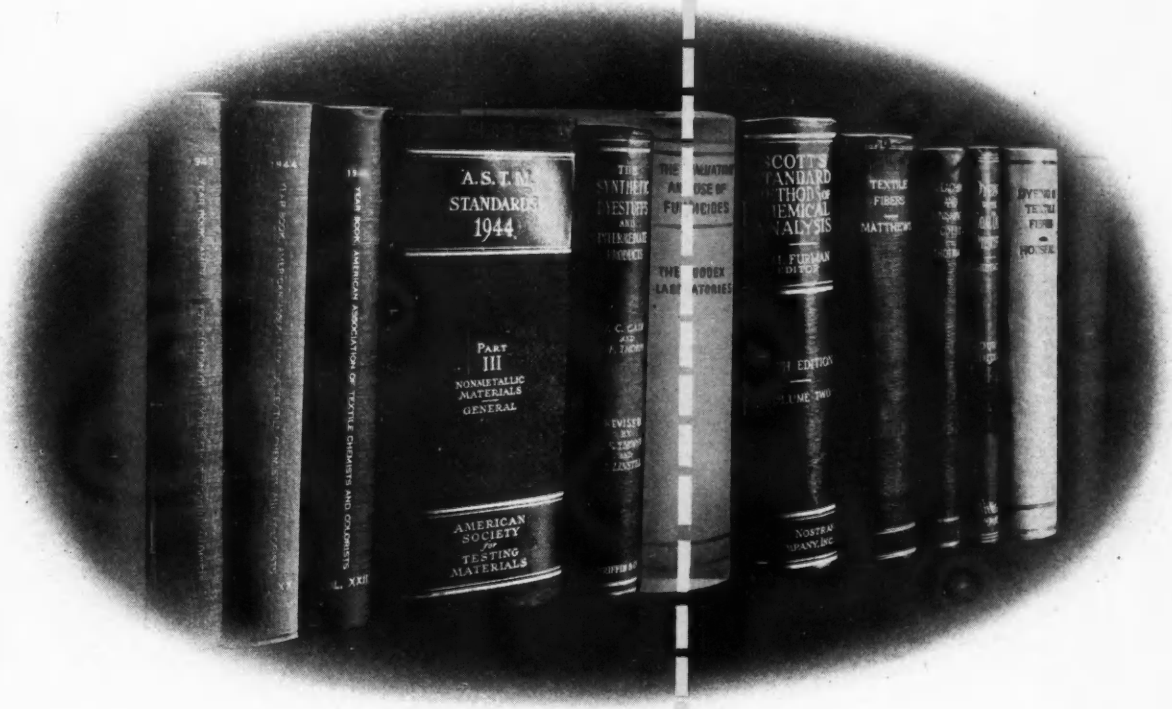
TEXTILE CHEMICAL, RESEARCH, DEVELOPMENT, or PRODUCTION: Experienced research director with excellent record of accomplishment and wide experience in textile finishes, synthetic organics, viscose products, printing, starches, proteins and plastics available for position in technical or research management or as a consultant. Write Box 208.

WANTED: BOSS DYER for plant located in the South. Must be familiar with vat, sulphur and napthol colors. Must also be familiar with package, raw stock and jig dyeing machines. Salary commensurate with qualifications and ability. Splendid opportunity for right man. Please give full details as to experience in first letter. Write Box 214.

GRADUATE CHEMIST: With several years industrial experience with soap, surface agents and related specialty products. Textile experience preferred. For development and research in New England laboratory. Give full details in first letter. Write Box 215.

WANTED: DYER (Second Hand) On Woolen and Worsted skein dyeing in Metropolitan area. Give past experience, age, and salary expected in first letter. Write Box 216.



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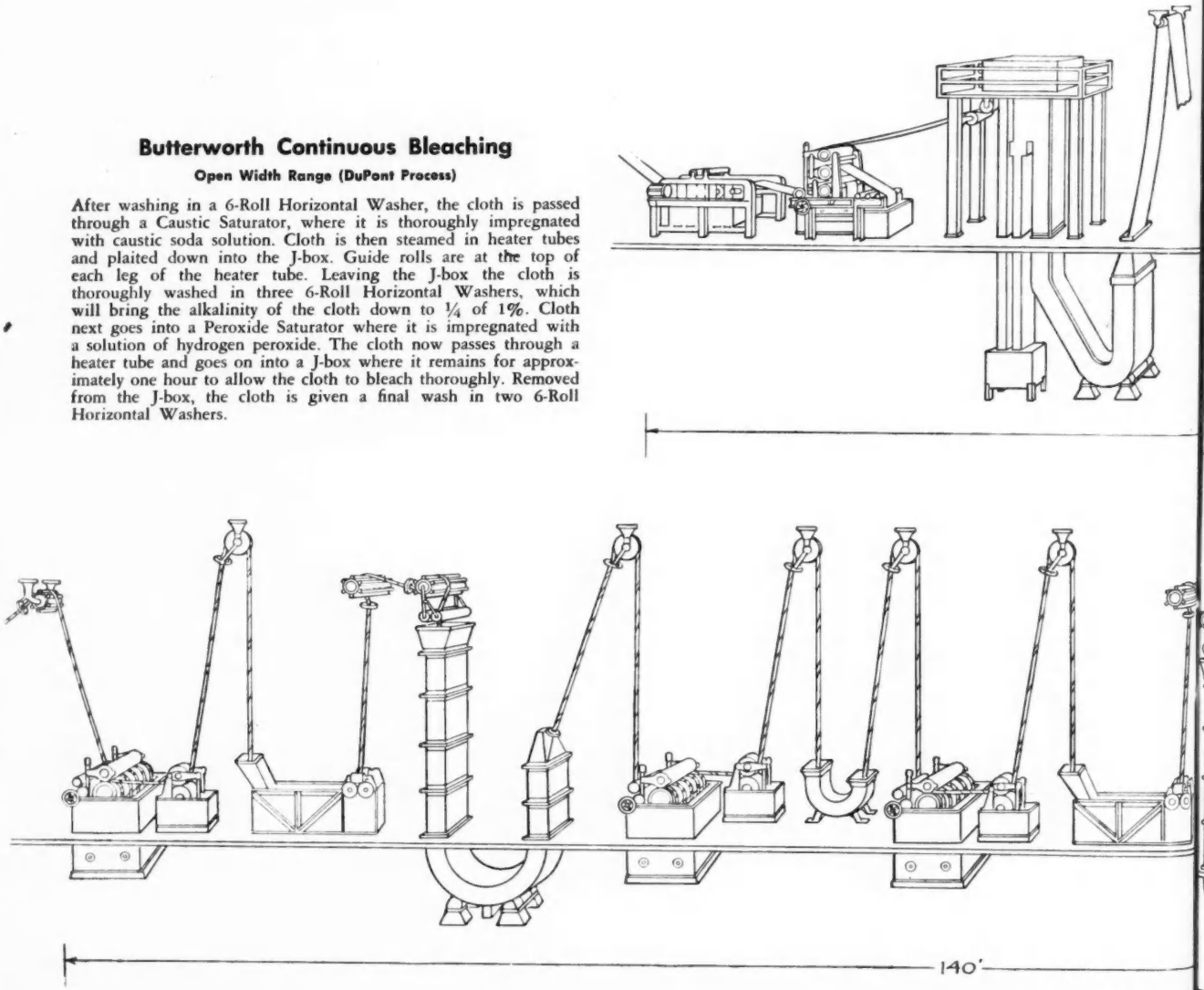

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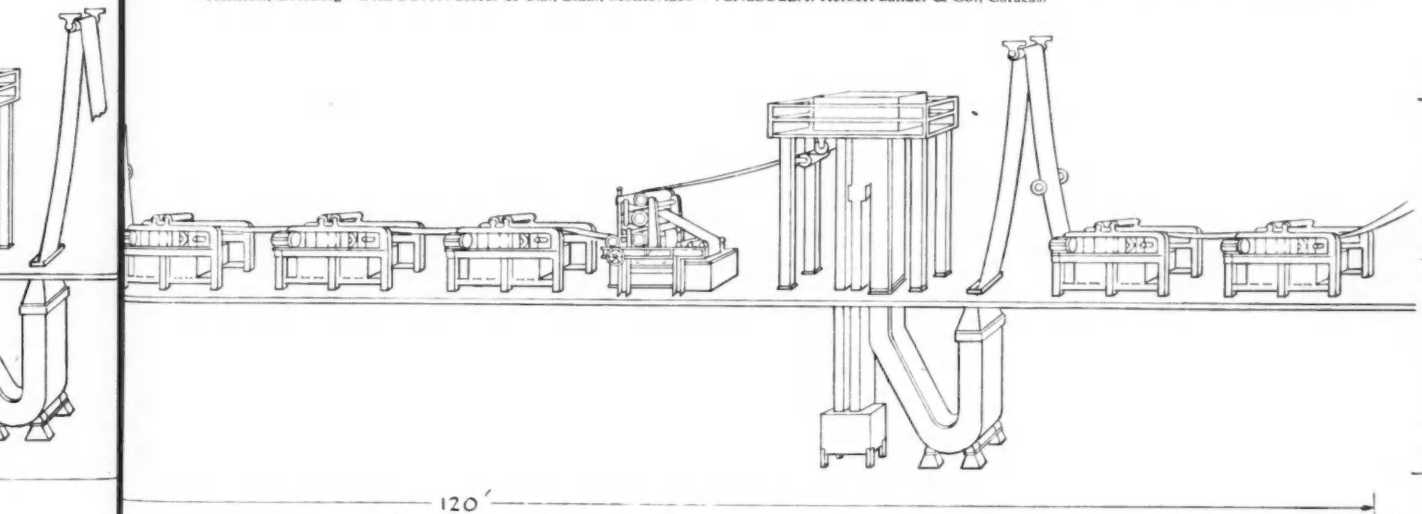

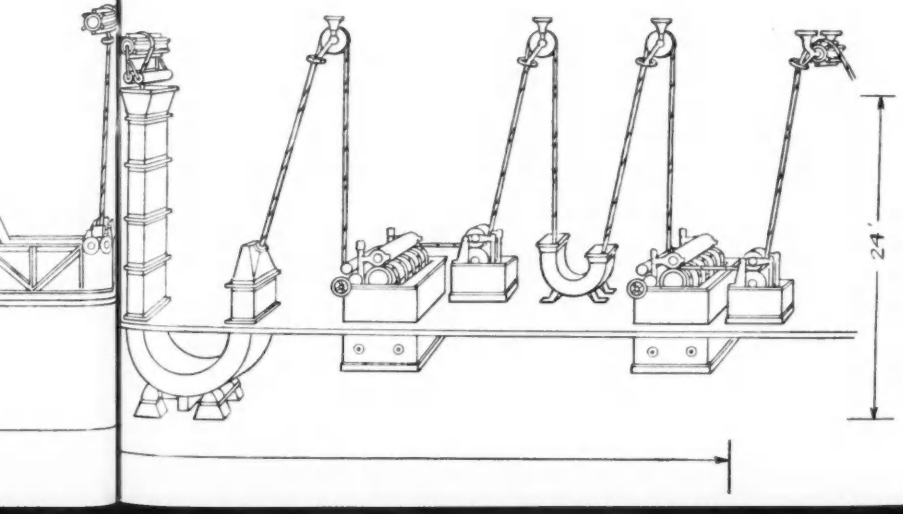

Butterworth Continuous Bleaching

Rope Range (Becco Process)

Cloth is washed in a Tight Rope Washer and given maximum extraction in a pneumatic Squeezer before going into the Caustic Saturator. Here the cloth is impregnated with caustic soda solution. At the delivery end of the machine, two horizontal squeeze rolls with pneumatic pressure device and recording instrument permit full knowledge of the pressure being applied. Cloth next goes through a Plaitor where a traveling pot-eye distributes the rope from front to back as well as across the width of the J-box. Steaming compartments in the third and fifth sections of the "J" and a small steaming unit in the bottom of the "J" are used according to the amount of goods in the J-box. Leaving the J-box the cloth is washed in a Tight Rope Washer, passed through a micro-set Squeezer and timing Scray, a small J-box for holding approximately 25 yards of goods. It then passes through another Tight Rope Washer and a pneumatic Squeezer where the desired extraction is achieved. This is followed by the application of hydrogen peroxide in a Peroxide Saturator. Goods are then fed through a Plaitor into a J-box; taken through a Tight Rope Washer and micro-set Squeezer, thence into a Scray, and then another wash in a Tight Rope Washer and delivered through a micro-set Squeezer into the white bins.

IN EITHER CASE YOU ELECT A WINNER FOR SCOURING WOOLEN PIECE GOODS

Experience doubtless influences your choice of the type of product used in your mill for scouring woolen piece goods. Your preference may be for soap . . . or it may be for synthetic detergents.

But whichever you prefer, you can count on excellent performance with Olate or Orvus. The proven advantages of these two products listed below will tell you why.

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Olate

A pure, neutral flaked soap of exceptionally low titer and gentle cleansing action.

Fast dissolving.

Fluid solutions penetrate fibers quickly and evenly.

Excellent emulsifying, and scouring and lubricating properties.

Fast rinsing.

Provides excellent protection against uneven shrinkage and minimizes harshness and stickiness.

Retains its efficiency in low temperature processing.

ORVUS*

A neutral synthetic detergent with an enviable record for safety.

Fast, thorough wetting, emulsifying and scouring action.

Guards against streaks and spots resulting from hard water soap deposits.

Works equally well in acid or alkaline baths.

Safe to fiber, fabric and color.

Promotes uniform, level dyeing.

Prevents development of undesirable odors and yellowing of goods in storage.

***Discuss your Orvus requirements with your Procter & Gamble salesman.**

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DESCRIPTION: Formaldehyde Solution U.S.P.; Formaldehyde content: not less than 37 per cent by weight.

APPEARANCE: Clear, colorless liquid; Low acid, ash, and metal content.

Formaldehyde *Heyden* is rigorously controlled to assure consistent yields and high quality of finished products. Technical data on the use and handling of formaldehyde are available upon your request.

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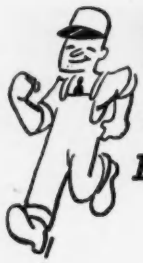

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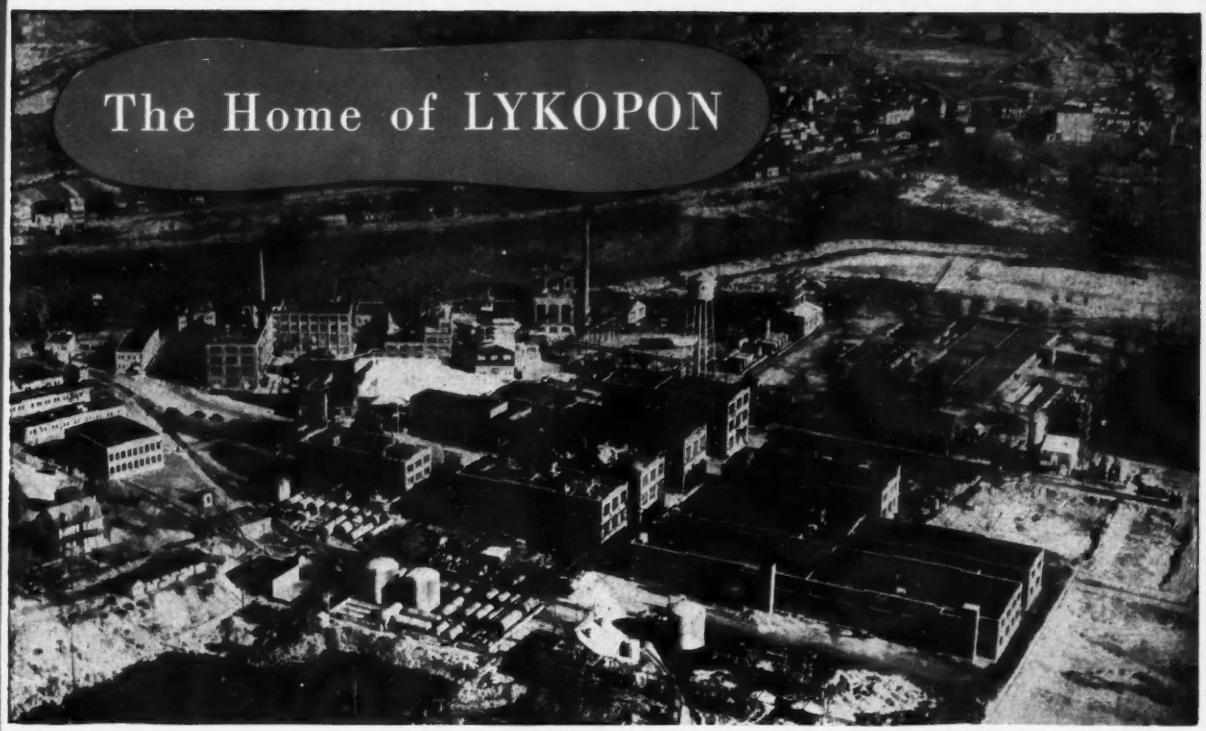

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The Fleet Line

STOCK DYE KETTLE

A New Safety Feature

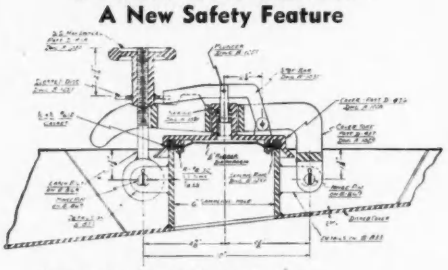

Diagram of Riggs & Lombard Safety Sampling Cover

Always outstanding for its efficiency, the Fleet Line Stock Dye Kettle* is now an even better investment because of a new safety sampling cover* which cannot be opened while the dye kettle is in operation.

A rubber diaphragm under the cover pushes up a plunger when the machine is in use. The plunger raises a stop bar to engage a slotted disc in the handwheel shaft, thus locking the cover opening wheel. (See the illustration above.) This device is standard equipment on all new stock dye kettles and may be added to machines now in place.

OTHER FEATURES

1. A panel board with temperature, pressure and depth indicators.
2. Will dye wool, cotton and rayon.
3. Main kettle and expansion tank in one unit.
4. Inside of kettle highly polished stainless steel plate.
5. Tilting or removable cover.
6. Unloading by electric or air hoist.
7. Kettle above floor insulated.
8. Pump submerged in dye liquor at all times. Driven by easily accessible motor. Delivers over stock. (No agitation of latter.)

*Reg. U. S. Pat. Off. Patents Nos. 2410214, 2275818 and 1813784.

CIRCULAR ON REQUEST

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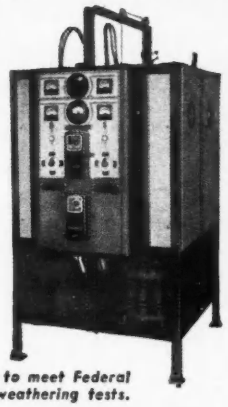
Weathering effects of sunlight, rain, heavy dew and thermal shock reproduced in the laboratory at an accelerated rate that reduces years of actual weathering to a few days of testing in the —

ATLAS TWIN-ARC WEATHER-OMETER

The Twin-Arc Weather-Ometer has full automatic control of light and water periods. The Atlas Cycle Timer unit can be set to reproduce any combination of weathering conditions. A direct reading thermal regulator, automatic shut-off switch and a running time meter is included on the control panel. After setting exposure cycle on the control panel the Weather-Ometer is safe to be left in continuous operation over night without attention except to replace carbons once in 24 hours.



The Atlas Weather-Ometer is required to meet Federal Specifications demanding accelerated weathering tests.

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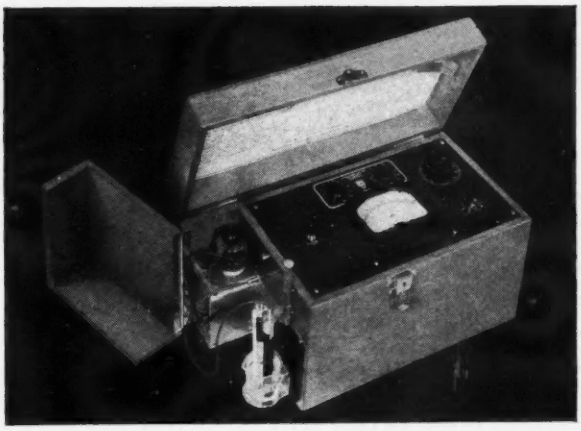

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Here's the pH Indicator for the man who is *not* a pH expert. It's carried around and used wherever desired—in plants as well as labs. It's sturdy and dependable as a temperature indicator. It will stay on the job. To use it, you just make 3 simple adjustments, then put the sample into the beaker and see where the needle points. Its scale is substantially longer and easier to read than in any comparable Indicator.

This Indicator is fine for laboratories, kitchens, refrigerated chests, packing rooms and power plants. "Sticky" weather or surroundings won't affect it, unless the relative humidity is over 95 per cent and the ambient temperature higher than 85 F. Solution to be checked can be at any temperature to 50 C (120 F). Thick solutions and "soft" solids can be checked almost as easily as slurries or clear liquids. Nearby electrical equipment won't affect the Indicator.

Further details are in Catalog E-96 (2), sent on request.

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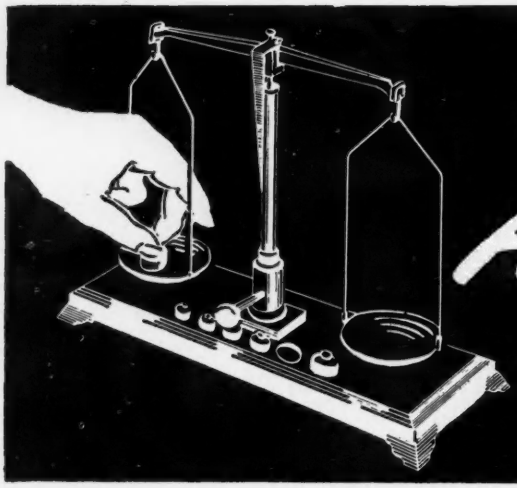

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ACCURATELY

to Get the Best Results!

For Accurate Salt Measurement

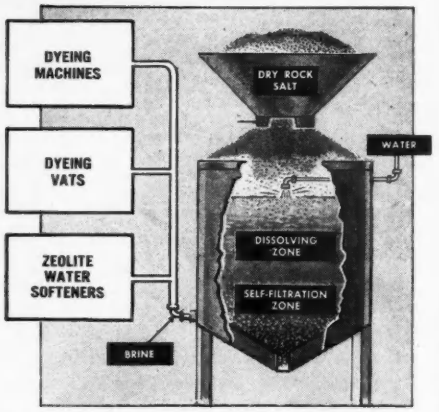
"PASS the SALT" BY LIXATOR

EVERY DYER knows that salt is a top-flight exhausting agent ... that it must be accurately measured to insure complete exhausting without waste ... and further that it must also be uniformly distributed in the dye bath to prevent spotting, streaking and white edges. The question is *how.*

With Lixate brine accurate salt measurement and uniform distribution are assured. For the Lixator automatically and continuously makes 100% saturated, crystal clear brine. Since each gallon of Lixate brine *always* contains 2.65 lbs. of salt—a definite volume of Lixate brine supplies a definite quantity of salt. The trouble and waste of measuring salt by hand or by mechanical devices, or of measuring by weight without regard to water absorption during storage, are things of the past. And added to the dye bath, salt, as brine, is immediately diluted and dispersed throughout.

Leading companies in your industry and many others are availing themselves of the Lixator's ability to measure salt accurately ... to reduce labor and handling costs and to improve the quality of their products. It will pay you to investigate the Lixate Process for making brine for your plant.

HOW THE LIXATOR WORKS



In the upper zone—Flowing through a bed of rock salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. **In the lower zone**—Through use of the self-filtration principle *originated by International*, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

WHAT THE LIXATOR PROVIDES

- ✓ Chemical and bacterial purity to meet the most exacting standards for brine
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- ✓ Crystal-clear brine
- ✓ Continuous supply of brine
- ✓ Automatic salt and water feed to Lixator
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Get the full story on why accurate salt measurement is *always* possible with Lixate brine. Send for your copy of our *free* pamphlet *today!*

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ATCOSYN-WS GIVES A LOFTIER HAND!

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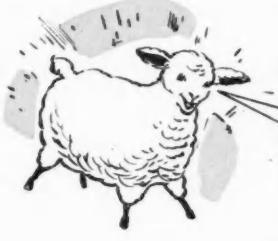

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Also a fast wetting agent and penetrant for dyeing packages, piece goods, skeins and raw stock.

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Those are a few headliners of the Houghton "Line"—well and favorably known to knitters the world over. For specific data, ask the Houghton Man who calls on you, or write—

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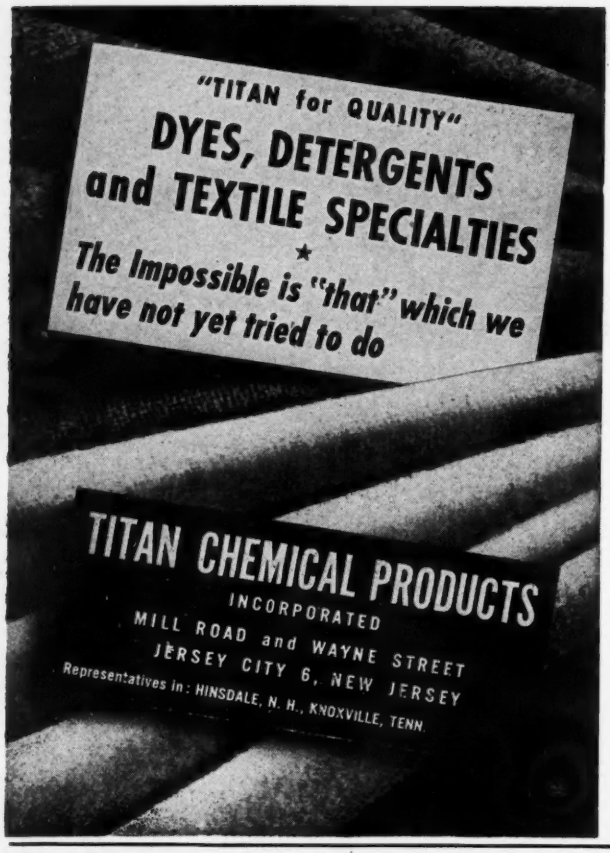
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AROMINE is effective in hard or soft water, acid or alkaline baths. Surprisingly small quantities are required for most textile applications. It is safe to say that there is no other textile chemical quite like AROMINE available.

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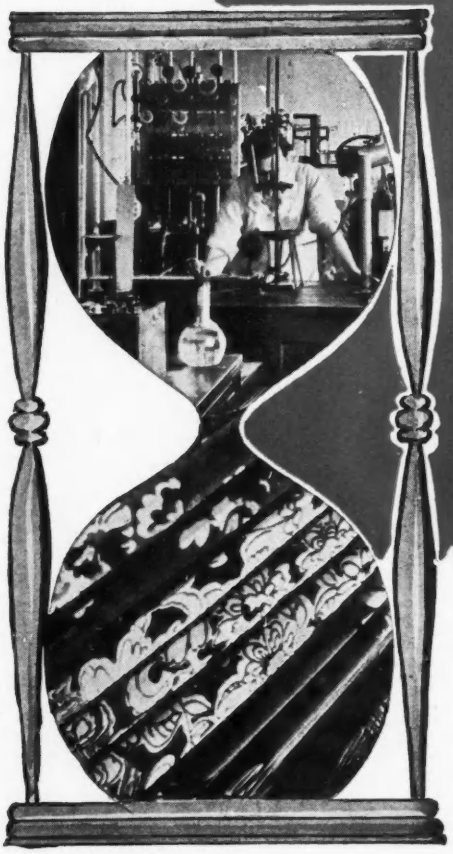

1922 — 1947

Since 1922, Standard Chemical Products, Inc., has concentrated on supplying the Textile Industry with a complete line of processing and finishing agents, formulated to meet the needs of the latest advances of textile chemistry. Each product is manufactured under strict laboratory supervision . . . carefully balanced to meet the most exacting requirements of operation and fiber.

Why not submit your problems or special needs to us, without obligation? Technical field representatives are conveniently located in leading textile centers to render mill service at all times.

25 YEARS OF CHEMICAL SERVICE TO THE TEXTILE INDUSTRY

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STANDARD CHEMICAL PRODUCTS, Inc.

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HIGH POINT, N. C. · LEAKSVILLE, N. C. · PATERSON, N. J.
CHATTANOOGA, TENN. · PROVIDENCE, R. I. · SACRAMENTO, CAL.

What a product!

All we ask you to do is to test this new
detergent against any other on the market
for stability in hard water, wetting-out
dispersing, foaming, etc. and then you
will see performance that will make you
say "what a Product."

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Repcol is the most efficient product on the market — yet it costs you less.

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• Manufacturers of PERMA-CIDE, the approved, outstanding, mildew-proofing agent

Southern Representative: DYER S. MOSS, 1301 Liberty Life Bldg., Charlotte, North Carolina

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CLARENCE E. MOSS, 19 Wilson Ave., Rumford (16) R. I.

Canadian Selling Agents: Berkeley Products Canada, Ltd., 41 Hillcrest Avenue, St. Catharines, Ontario, Canada
Exporting Agent: Chem-Col Company, 82 Wall St., New York City

Who? Me silly?

Not at all. I'm just illustrating a point. We girls would rather sally forth looking like a caricature of a fisherman than arrive at our destination wearing water-spotted hosiery. We could start out dressed to kill . . . but what's the use if our glamour is going to be ruined by baggy, water-splashed stockings.

We want *DuraBeau* Finished Hosiery . . . gorgeous, elastic, smoky dull . . . enduring, snag-resistant . . . with *water and spot-repellency*. It definitely wears longer, always looks better, stays lastingly beautiful.

DuraBeau Finished Hosiery builds confidence.

DuraBeau
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TEXTILE FINISHES

Scholler Bros., Inc.

Mfrs. of Textile Soaps, Softeners, Oils, Finishes • Collins & Westmoreland Sts., Phila. 34. Pa. • St. Catharines, Ont., Can.

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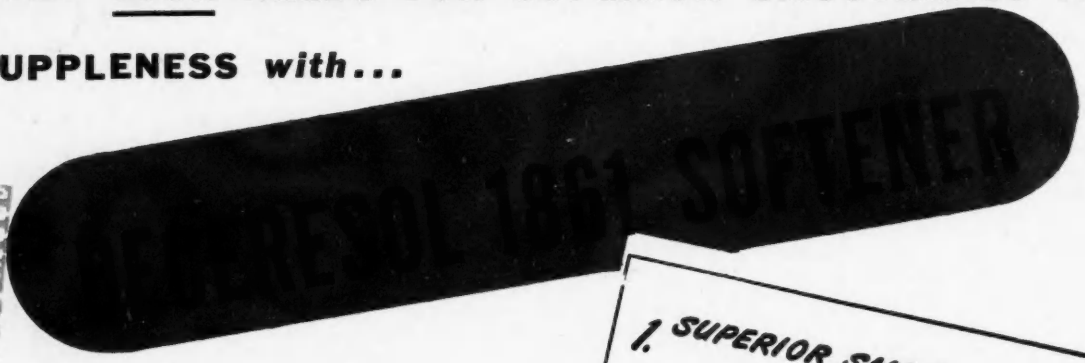
MEET YOUR NEEDS FOR SUPERIOR SMOOTHNESS AND SUPPLENESS *with...*



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DECERESOL* 1861 Softener . . . a durable, exceptionally compatible, odorless, surface active colloidal material . . . "engineered" to meet the demands of modern high speed textile processing. Excellent for yarns and fabrics; also for knitgoods where retention of elasticity is desired.

Be sure to send for Technical Bulletin giving general properties and full applications details.

★

AMONG CYANAMID PRODUCTS FOR THE TEXTILE INDUSTRY ARE . . . Penetrants, Softeners, Finishes, Sizing Compounds, DECERESOL* Wetting Agents, PARAMUL** 115 Water Repellent, and other Specialties and Heavy Chemicals

*Reg. U. S. Pat. Off. **Trade-mark

DO NOT CIRCULATE

1. SUPERIOR SMOOTHNESS

and suppleness of hand in woolens, cottons, rayons and other specialties. Softening qualities retained after laundering and dry cleaning.

2. REDUCED BLEEDING

of direct colors . . . *cracking* of naphthol colors. Minimizes gas-fading of certain acetate colors.

3. HIGH COMPATABILITY

with gums, starches, solvents, acids and dilute alkalies (less than 1% NaOH).

4. SATISFACTORY REACTIONS

with sulphonated oils and casein solutions, when used in proper ratios.

5. GOOD DISPERSION AND STABLE SUSPENSION...

eliminates need for additional wetting agents in most instances.

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Industrial Chemicals Division

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